S.Ü. Ziraat Fakültesi Dergisi 3(5): 79-84, 1993

DETERMINATION OF THE RELATIONSHIPS BETWEEN HEMOGLOBIN TYPES AND SOME PRODUCTION TRAITS IN KONYA MERINO SHEEP

*S. BOZTEPE** *A. ÖZTÜRK** *C. KINANÇ***

ABSTRACT

One hundred thirty-four adult Konya Merino ewes [Merino x White Karaman (G2 and G3)] were typed for hemoglobin types. Gene frequency of hemoglobin A (Hb A) was found to be 0.0895. The relationship between hemoglobin types and some production traits were examined. No significant correlation was found between Hb types and any traits.

INTRODUCTION

In recent years, the associations between blood biochemical polymorphic traits and some production traits in different sheep have been studied. It may be an indirect selection criterion for animal breeding.

In sheep, hemoglobin types have been reported as three types, that Hb A, Hb B and Hb AB (Harris and Warren, 1955).

The associations between polymorphic traits and some production traits might depend on the effects and degrees of genes. If a gene possesses two effects, the relationships between polymorphic characters and production traits may be the reason for some correlations. This correlation may be because of linkage genes that are on same chromosomes.

In this study, the hemoglobin genes and genotype frequencies, and the relationships between Hb types and birth weight (BW), conception rate (CR), litter size (LS) and wool yield (WY) were studied.

MATERIALS AND METHODS

Animals : One hundred thirty-four Konya Merino sheep were used in this study. Konya Merino contains 75 to 80 % blood of Merino and 15 to 20 % blood of White Karaman (Yalçın et al., 1980). These animals were adult females and males of different ages. They were maintained under the conditions Central Animal Research Institute in Konya

Blood Collections : Blood samples were collected by jugular

* Assist. Prof. Dr. Department of Animal Sci., Faculty of Agriculture Selçuk University, 42079, Konya- Turkey

** Agricultural Engineer, Faculty of Agriculture Selcuk Univ., 42079, Konya- Turkey

Geliş Tarihi : 14.4.1993

venipuncture directly into tubes that contained anticoagulant (ammonium oxalate). The samples of approximetely 5 ml were taken by dispossible injector. Blood analyses were carried out within 6 h of collection.

Determination of Hb Types : The Hb types were determined by using the cellulose acetate electrophoresis technique reported by Tietz (1976). Tris-EDTA borate buffer (pH= 8.6) was used as a buffer solution.

Statistical Procedures : Data were analyzed by least squares method as outlined by Harvey (1987). For birth weight, conception rate and litter size, the following model was used :

$Y_{ijn} = m + a_i + b_i + e_{ij}$

here

Y_{ijn} : the n_{th} observations within the i_{th} ages within the j_{th} hemoglobin types,

m : the population mean,

a_i : the effect of i_{th} ages,

b_j : the effect of j_{th} hemoglobin types, and

e_{ijn} : the effect of error.

For wool yield the model is as follows :

$Y_{ijkn} = m + a_i + b_j + c_k + e_{ijkn}$

here

Y_{ijkn} : the n_{th} observation within the i_{th} ages within the j_{th} Hb types within the k_{th} sex,

m : the population mean,

a_i : the effect of i_{th} ages,

b_j : the effect of j_{th} Hb types,

c_k : the effect of k_{th} sex, and

e_{ijkn} : the effect of error.

RESULTS AND DISCUSSION

The distribution of hemoglobin gene and genotype frequencies are shown in table 1. Animals that were Hb B type were found to predominate in this breed.

The result of research relating to Hb gene frequency is very interesting. Because Hb B gene frequency was the highest in this study. Many researchers reported the low Hb B gene frequencies in Merino sheep (Table 2).

Our findings on frequencies differ from those reported by Evans et al. (1958), Evans and Blunt (1961) and Khattab (1968). However, they are similar to findings of Meyer (1963) and Yaman et al. (1987), indicating the Hb B gene will be in relation to adaptation in Turkey, India and Far East countries.

According to hemoglobin types, the means of birth weight, conception rate, litter size and wool yield and their standard errors are shown Table 3.

According to statistical results, there is no significant association between hemoglobin type and production traits. However, the associtions between hemoglobin type and birth weight found significant at 0.08 levels.

The result relating to birth weight was similar to that reported by Meyer et al. (1967), Arora and Acharya (1972), Brown et al. (1980), Kumar (1983) and Boztepe (1992). However, it differ from data presented by Lazowskii and Gorin (1978), who does found the association to be sttistically significant.

Another finding, that no significant relationships between Hb types and conception rate and litter size, was similar to that published by Arora et al. (1971) and Weimer et al. (1984). Whereas, it does differ from results of Dally et al. (1980) and Brown et al. (1980), who reported the relationship statistically significant.

The result of wool yield was similar to that reported by Agar et al. (1972). Dally et al. (1980) and Başpınar et al. (1987). Results data presented by Soysal (1983), Marian et al. (1986) and Boztepe (1992) were different from our results.

In conclusion, the results indicate Hb types may not be an indirect selection criteria for this traits in animal breeding.

LIRETARUTE CITED

Agar, N.S., J. Roberts and J.V. Evans, 1972. Red blood cell potassium and hemoglobin polymorphism in sheep. Anim. Bred. Abs. 40: 407.

Arora, C.L., R.M. Acharya and S.N. Kakar, 1971. A note on the association of hemoglobin types with ewe and ram fertility and lamb mortality in Indian sheep. Anim. Prod. 13: 371.

Arora, C.L. and R.M. Acharya, 1972. A note on hemoglobin and potassium types in Nali breed of Indian sheep and the relationship with body weights and wool yields. Anim. Prod. 15: 95.

Başpınar, H., K. Yaman, H. Çamaş, H. Gökçe and H. Erdinç, 1987. Studies on relationships between hemoglobin types and some fleece properties of Karacabey Merino lambs. Uludağ Univ. Fac. Vet. J. 5-6, 163 (in Turkish).

Boztepe, S. 1992. Determination of relationships between blood potassium

and hemoglobin types and some production traits of Akkaraman and Awassi sheep in the state farm of Gözlü. Unpublished Ph. D. Thesis. Selçuk Univ. Fac. Agric. Konya (in Turkish).

Brown, D.R., D.E. Franke and P.E. Humes, 1980. Performane of ewes classified by hemoglobin type. J. Anim. Sci. 51: 8.

Dally, M.R., W. Hohenboken, D.L. Thomas and A.M. Craig, 1980. Relationships between hemoglobin type and reproduction, lamb, wool and milk production and health-related traits in crossbred ewes. J. Anim. Sci. 50: 418.

Evans, J.V. and M.H. Blunt, 1961. Variation in the gene frequencies of potassium and hemoglobin types in Romney Marsh and Southdown sheep established away from their native environment. Aust. J. Biol. Sci. 14: 100.

Evans, J.V., H. Harris and F.L. Warren, 1958. Hemoglobin and potassium blood types in some non-British breeds of sheep and in certain rare British breeds. Nature 182: 320.

Fechter, H. and S.J. Myburg, 1968. Hemoglobin and potassium types in South African sheep breeds. Anim. Bred. Abst. 36: 1.

Harris, H. and F.L. Warren, 1955. Occurrence of electrophoretically distinct hemoglobins in ruminant. Biochem. J. 60: 29.

Harvey, W.R. 1987. User's quide for LSMLMW PC-1 version mixed model, Least squares and maximum likelihood computer program. Ohio State Univ. Columbus, Mimeo.

Khattab, A.G. 1968. Hemoglobin type and blood potassium and sodium concentrations in Sudan desert sheep. J. Agric. Sci. 70: 95.

Kumar, G.P. 1983. Genetic studies on hemoglobin and potassium polymorphism and their relationship with body weights in Bannur sheep. Anim. Bred. Abst. 52: 7240.

Lazowskii, A.A. and V.I. Gorin, 1978. Inherited potassium, hemoglobin and transferrin types and the possibilities of using these in selection of sheep for live weight. Anim. Bred. Abst. 46: 3.

Marian, P., D. Iozon, M. Zaharescu, A. Sara, T. Petrut, M. Popovici and D. Oprea, 1986. Hemoglobin and erytrocyte potassium polymorphism in Corriedale sheep. Anim. Bred. Abst. 54: 5.

Meyer, H. 1963. Vorkommen und verbretung der blutkalium typen in deutschen schafrassen. Z. Tierzucht. ZuchtBiol. 79: 162.

Meyer, H., B. Lohse and M. Groning, 1967. A contribution to hemoglobin and blood potassium polymorphism in the sheep. Anim. Breed. Abstr. 36: 1550.

Soysal, M. I. 1983. Genetic structure for some inherited polimorfic blood

proteins and the relationships between some production traits and these biochemical charecters in Atatürk University sheep population. Unpublished Ph. D. Thesis. (in Turkish).

Tietz, N.W. 1976. Fundamentals of Clinical Chemistry. W.B. Saunders. London.

Yalçın, B.C., Ş. Müftüoğlu and B. Yurtcu, 1980. Possibilities of improving important production characteristics of Konya Merino sheep through selection. J. Inst. Research Zootec. Lalahan, 61. (in Turkish) .

Yaman, K., H. Erdinç, H. Başpınar, H. Çamas and H. Gökcen, 1987. Studies on relationships between some blood parameters (transferrin, hemoglobin, glutatione, testosteron) and live weight gain in Karacabey Merino lambs. II. Relationship between hemoglobin types and live weight gain. Uludağ Univ. Fac. Vet. 5-6: 35. (in Turkish).

Table 1. Distribution of hemoglobin gene and genotype frequencies

Genotype frequency, %			Gene frequency, %	
AA	AB	BB	A	B
1.49 (2)	14.93 (20)	83.58 (112) a	8.95	91.05

a : Number of animals

Table 2. Hb gene freguencies reported by some researchers in Merino sheep

Sample from	Hb gene frequency		References
	A	B	
Australia	0.38	0.62	Evans et al. (1958)
Australia	0.45	0.55	Evans and Blunt (1961)
Sudan	0.50	0.50	Khattab (1968)
South Africa	0.20	0.80	Fechter and Myburg (1968)
India	0.13	0.87	Meyer (1963)
Turkey	0.09	0.91	Yaman et al. (1987)

Table 3. According to Hb types, birth weight, conception rate, litter size, and wool yield means and their SE

Production trait	Hemoglobin type		
	A	AB	BB
BW, (kg)	--	4.09±0.470	5.11±0.189
CR, (%)	95±0.259	79±0.097	87±0.044
LS, (%)	145±0.369	148±0.167	149±0.074
WY, (kg)	4.26±0.512	4.68±0.237	4.79±0.171