# Inheritance of blood potassium and Hemoglobin types in Naemi sheep and their relation with some productive characters

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## Summary

Some ٣٦ Naemi ewes , ٤ rams were typed for blood potassium and hemoglobin , and ١٩ offspring were typed for blood potassium . HK (High potassium) gene frequencies for ewes, rams and lambs were of the order of ٠,٨٧, ٠,٨٧ and ٠,٨٩ respectively , for the HbB gene the frequency for sheep was ٠,٩٧ . HK sheep had a significantly higher in birth weight and body weight ($p<٠,٠١$), and HK sheep showed better fiber diameter than that in LK (low potassium) sheep, ($p<٠,٠٥$), and there was no significant differences in regarding of fiber length. The association between HbB (Hemoglobin type B) and HK type and fitness were proposed as the explanation of the high gene frequency of this type.

## Introduction

The study of potassium concentration level in the blood of sheep and the association of some blood biochemical polymorphism with production and reproduction traits in sheep has been investigated by many workers in several countries ( Evans and King, ١٩٥٥; Evans et al., ١٩٥٦; King et al., ١٩٥٨; Evans, ١٩٦١; Khattab et al., ١٩٦٤; Agar et al., ١٩٦٩; Singh and Sing, ١٩٧١; Arora et al., ١٩٧١; Sing et al., ١٩٧٣; Krishnamurthy and Rathnasabapathy, ١٩٧٧, ١٩٧٩ ; Erkoc et al. ١٩٨٧; Clark et al. ١٩٨٩; Dunham and Blostein, ١٩٩٧; and Lauf et al. ٢٠٠١). Most agree on the mode of inheritance, but give inconclusive results regarding gene frequencies and the type and direction of genetic relationships. Different results are to be expected since the various studies were conducted in several countries, used a number of breeds and sample sizes and there would be differences in adaptive forces or natural selection.

Due to the specificity of the result of the sample chosen and country of origin it was decided to conduct this study on the Naemi breed of sheep which is regard as a part of Awassi sheep, but adaptive and acclimatized for living and is present in most of the west geographical region of Iraq.

## Materials and Methods

Some ٣٦ Naemi ewes , ٤ rams and ١٩ offspring were typed for blood potassium and hemoglobin type.
The sheep were maintained on a private farm near Falloja city, and had been under a closed system of breeding for many generation., during which time management and nutrition were kept constant . Some of the mating identified to sire and the record used to study the mode of inheritance of blood potassium and hemoglobin types. Blood potassium (m.equiv./L.blood) was determined by the use of an Atomic absorption flame photometer (GBC ٩٣٣ plus ). Cellulose acetate electrophoresis was used for the separation and identification of hemoglobin types. Gene frequencies of potassium and hemoglobin types were calculated according to the method of Falconer (١٩٦٠).

## Results

Potassium concentration level in blood

The results demonstrated that the level of potassium concentration divided into two groups in Naemi sheep depending in potassium concentration level in sheep blood ( high potassium concentration HK and low potassium concentration LK),table (١).

Table (١)
Distribution of potassium concentration level in Naemi breed

| Breed | | Number of animals | Mean ± SE ml.eq/ L blood | Range ml.eq/ L blood |
|---|---|---|---|---|
| Naemi sheep | Whole blood | ٤٠ | ٢٦,٧٢ ± ٠,٥٦ | ٢٥-٣٥ |
| | HK | ٣٠ | ٣٢,٨١ ± ٠,٤٨ | ٢٧-٣٥ |
| | LK | ١٠ | ٨,٤٤ ± ٠,٦٥ | ٣,٥-١٨ |

(HK) High potassium , (LK) Low potassium

The differences of potassium concentration of these two groups are highly significance (p<٠,٠١), also the differences in potassium concentration among all sheep in one hand and between each type of concentration (HK and LK) in the other hand are highly significance (p<٠,٠١) too , Which was classified in figure ١ , which shown also a bimodal distribution of potassium level ie high (HK) and low (LK) distribution in Naemi population sheep , (p<٠,٠١) .

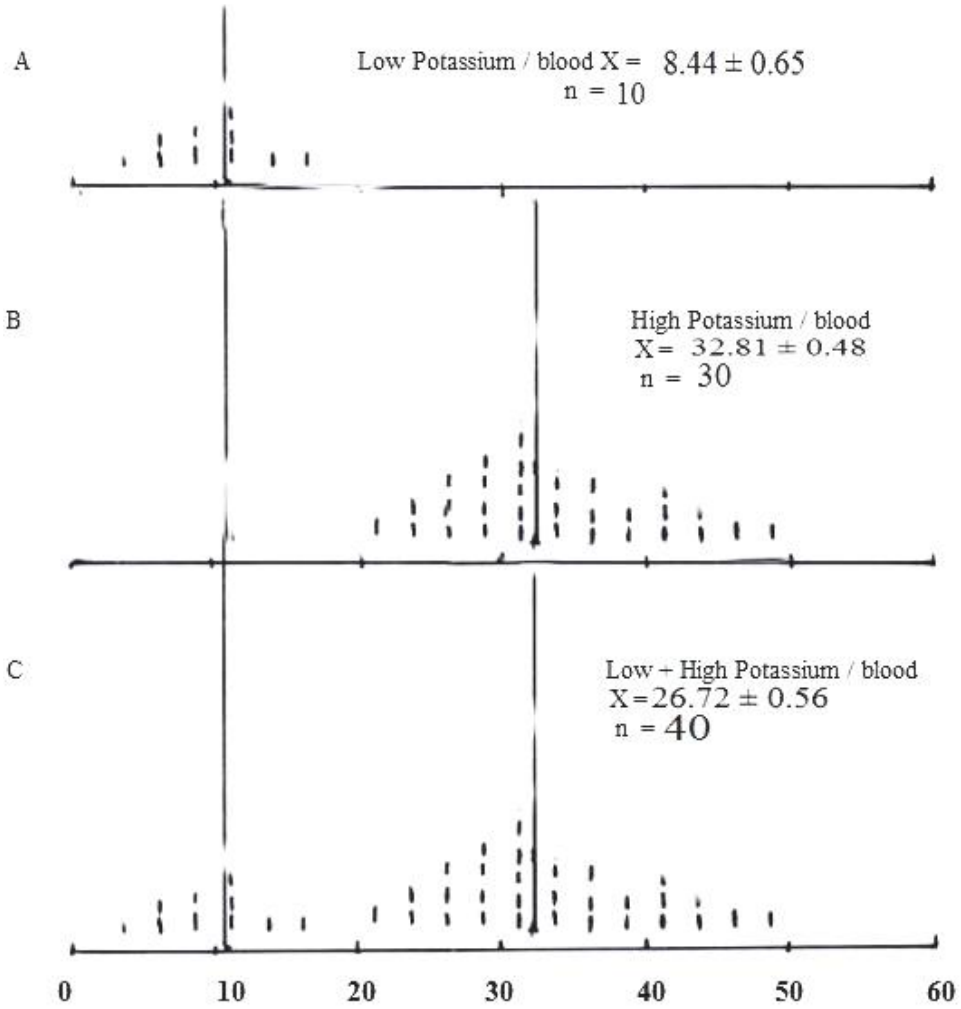


Figure 1: Frequency distribution of blood Potassium level in Naemi sheep (Capital letters indicate significancy $p<0.01$)

Hemoglobin types

Migration of hemoglobin bounds due to electrophoresis indicated the present of two types of hemoglobin in Naemi sheep ( Hb BB and Hb AB), only ٤ animals were type AB (٣ ewes and ١ ram) and most percentage were type BB , table ٢ , and because of this low number of Hb type AB so; this study not include the lambs .

Frequency and inheritance of potassium and hemoglobin types

The results showed that ٧٥٪ of the ewes, ٧٩٪ of their lambs and ٧٥٪ of the rams were of high potassium (HK) type. For hemoglobin type ٩٥٪ and ١٠٠٪ of ewes and rams respectively were of HbB type. The remainder of the ewes and lambs were of HbAB type. There were no clear line of demarcation between high (HK) and low (LK) potassium types in ewe and lambs as some of ٥٪ of those typed were intermediate (figure ١).
Among all animals sampled HK and HbB gene frequencies were very high (Table ٢). There were no significant differences in gene frequencies of potassium level between the ewes and their lambs or between observed and expected phenotype frequencies among the lambs.

Table ٢ : Distribution of potassium and hemoglobin types and their appropriate gene frequencies for Naemi sheep

| Naemi sheep | Potassium types | | | Hemoglobin types | | |
|---|---|---|---|---|---|---|
| | HK | LK | HK gene frequency | B | AB | B gene frequency |
| Ewes | ٢٧ | ٩ | ٠,٨٧ | ٣٤ | ٢ | ٠,٩٧ |
| Lambs | | | | | | |
| Observed | ١٥ | ٤ | ٠,٨٩ | | | |
| Expected | ١٤,٢٥ | ٤,٧٥ | | | | |

There is no significant differences between the expected and Observed lambs numbers according to K level

Analysis of the mating types were classified in depending on the level of potassium concentration (HK and LK) as shown in table ٣ .

Table ٣: Mating type according to K level

| Ram | Ewes | Lambs |
|---|---|---|
| ٣HK | ١٠ HK | ١٠ HK |
| | ٢ LK | ١ HK<br>٢ LK |
| ١LK | ٤ HK | ٣ HK<br>٢ LK |

| | ١ LK | ١ HK |
|---|---|---|

So, all crossing of HK x HK produced HK lambs, while HK x LK , LK x HK and LK x LK mating produce the two types of potassium levels lambs , and that proved the LK is a dominant character and its either homozygous or heterozygous , and HK is a homozygous recessive character .

Production and reproduction Traits

Mean values for fiber diameter , fiber length and Mean body weight of lambs at birth and the weight of old sheep are present in table ٤ .
Mean body weight of lambs at birth and the weight of old sheep among the Hk type are higher significantly than those in LK corresponding data type (p<٠,٠١) table ٤ , Fiber diameter was significantly higher (P<٠,٠١) for HK wool. Phenotypic correlations between potassium concentration and body weight at birth and in old sheep ; pooled data were positive in direction and significantly different from zero (p<٠,٠٥). Phenotypic correlations between potassium (pooled HK and LK data) concentration and fiber diameter , were significantly different from zero (p<٠,٠٥) ..

Table ٤ Potassium types and some productive and reproductive

| Trait | Type | | Level of significance |
|---|---|---|---|
| | HK | LK | |
| Body weight | ٣٠,٤٧ ± ٠,٢٣ | ٢٨,١٠ ± o.٥٠ | ** |
| Body weight At birth | ٣,٩٥ ± ٠,١١ | ٣,٦٧± ٠,٢٠ | ** |
| Fiber diameter µ | ٢٢,٨٩ ± ٠,٣٤ | ٢١,٥٠ ± ٠,٤١ | * |
| Fiber length cm | ١٣,٦٧ ± ٠,٣٣ | ١٢,٦٧ ± ٠,٦٢ | |

* P<٠,٠٥ **P<٠,٠١

Discussion

Analysis of the mating types showed the same mode of inheritance for K and Hb blood types as that reported by Evans and King (١٩٥٥). Evans et al. (١٩٥٦) and Khattab et al. (١٩٦٤); Reddy et al. (١٩٩٠); Campbell et al. (١٩٩٨); Taiwo and Ogunsenm, (٢٠٠٣); Nihat et al. (٢٠٠٣); Al-Samarrae (٢٠٠٦).

Since results obtained in studies of this nature are markedly influenced by conditions under which they were conducted , a comparison with others , although undertaken in the same field of research , but using different breeds and or in different regions must be of limited value . consequently this discussion will center on the significance of the prevalence of HbB and HK types among groups of Naemi sheep.

This raises the question as to whether such genes (i.e., HK and B) are associated with some aspects of fitness and consequently are preferred by natural selection. This is especially so because of the results presented here which reflect a higher production among HK-BB types. Alternatively is the result due to random genetic drift which is expected to occur in small populations ? On the other hand it may be due to some kind of artificial selection for such genes arising from their association with some characteristics preferred by breeders .

The very close and high HK and HbB gene frequencies (٠,٠,٨٧ and ٠,٩٧, respectively) found must exclude random genetic drift and or artificial selection as major causes of such frequencies. This leaves one possibility namely , that this high frequency is due mainly to the association of such gene with aspects of fitness, with animals of those types being preferred by natural selection for many generations .

In a study conducted earlier , Evans et al.(١٩٥٨) found the frequency of HK and HbB genes was about ٠,٩٥ for Iraqi Awassi sheep. The present estimate falls within the ٩٥٪ confidence interval of that of Evans et al.( ١٩٥٨).

When the expected change gene frequency in ١ generation is calculated (Falconer , ١٩٦٠) , allowing selection to work against the dominant allele (LK), or favors the recessive and q to be =٠,٩ and s=٠,١ , the resultant value is about ٠,٠٠٨. This small change, in the presence of other systematic and dispersive processes, is too weak to be noticed, or to produce a drastic shift in the present gene frequencies. On these bases it is expected that the persistency of the polymorphic state and the ٢ other alleles ( LK and HbA) will remain in the population for many generations.

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