

Blood Parameters that Affect Awasi Sheep Production

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Abstract: This experiment was conducted to demonstrate the genetic relationship between potassium concentration in the blood and some productive and reproductive characters of Iraqi Awasi sheep. Awasi ewes, rams and their offspring, they have been adopted in this experiment, blood potassium HK gene frequencies for ewes, rams, and lambs were of the order of 0.91, 0.95 and 0.92, respectively. HK ewes had a significantly higher lambing percentage, fleece weight, fiber diameter, wax percentage of the fleece and alkali solubility percentage. LK ewes produced significantly more female lambs while LK lambs, compared with HK ones, had significantly higher birth and weaning weights. The association between HK types and fitness was proposed as the explanation of the high gene frequency of this type.

Keywords: blood parameters, reproduction, sheep, Iraq

1. Introduction

The association of some blood biochemical polymorphism with production and reproduction traits in sheep has been investigated by many workers in several countries [1-10]. Most agree on the mode of inheritance, but give inconclusive results regarding gene frequencies and the type of direction of genetic relationships, they all agree that potassium concentration in red blood cells in sheep controlled by two alleles on a single gene, and there are K^H allele which is responsible for high potassium concentration in blood and K^L which is responsible for low potassium concentration in blood, and the K^L is completely dominant and K^H allele is completely recessive, so there are three genotype of this character; $K^H K^H$ homozygous recessive which give rise to HK phenotype (high potassium concentration), $K^L K^H$ heterozygous dominants which give rise to LK phenotypes (so the LK blood type either homozygous or heterozygous) and the last genotype is $K^L K^L$ homozygous dominant which give rise to LK phenotypes (low potassium concentration). 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 [11-22]. 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 (natural selection).

Due to the specificity of the results to the sample chosen and country of origin it was decided to conduct this study on the Iraqi Awasi breed of sheep as it constitutes more than 60% of the sheep population in Iraq and is present in most of the countries in this geographical region.

2. Materials and Methods

Some 68 ewes, 9 rams and 74 of their lambs were sampled for blood potassium type and 73 ewes, 9 ram. The sheep were maintained on a private farm in Diyala Province, and had been under a close system of breeding for many generations, during which time management and nutrition were kept constant. Some of the mating was identified to sire and

the records used to study the mode of inheritance of blood potassium and haemoglobin types.

Blood potassium (m-equiv. K/l RBC's) was determined by the use of an Atomic absorption flame photometer 10 AL, GBC 933 plus "Tokyo-photoelectric company- LTD-Japan". Gene frequencies of potassium types were calculated according to the method of Falconer [23]. Wool samples were collected at the time of shearing from the mid-back region. Several wool characteristics were studied and compared while some aspects of fertility and growth were recorded and subsequently analyzed. Statistical analyses followed the methods of Snedecor and Cochran [24].

3. Results

3.1 Frequency and inheritance of Potassium types

The results showed that 85% of the ewes, 72% of their lambs and 88% of the rams were of high potassium (HK) type. There was no clear line of demarcation between high (HK) and low (LK) potassium types in ewes and lambs as some 5% of those typed were intermediate. Rams were clearly separated into HK and LK types. Among all animals sampled HK and LK (Table 1), there was no significant difference between gene frequencies of the ewes and their lambs.

Table 1: Distribution of potassium and haemoglobin types and gene frequencies for the Awasi breed

Animals	Potassium types		
	HK	LK	HK gene frequency
Ewes	54	14	0.91
Lambs	57	17	0.92
Rams	8	1	0.95

3.2 Reproduction Traits

Fertility percentage (measured as number of ewes lambing to number mated). Lambing percentage (number of lambs relative to the number of ewes mated), twinning percentage, female lambs born percentage and mortality percentage were calculated on a within potassium type basis. Figures given in

Table 2 show that HK type was superior in all aspects of fertility, but only significantly so for lambing percentage. Relatively more female lambs were born ($p < 0.01$) and there was a lower lamb mortality among the LK type.

Table 2: Potassium and haemoglobin types and some aspects of reproduction and growth in Iraqi Awasi sheep

Trait	Type		Level of significance
	HK	LK	
Fertility%	83.9	80.2	
Lambing%	95.5	85.7	1,2,3,4 **
Twining%	18.6	6.7	
Mortality%	3.6	0	
Female crop%	41.7%	60%	**
Body wt. at Birth(kg)	4.6	4.89	*
Weaning(kg)	19.9	20.8	*

* $p < 0.05$. ** $p < 0.01$.

3.3 Production Traits

Mean body weight of lambs at birth and weaning among the LK type was significantly higher, but this difference between potassium types small. Phenotypic correlation between potassium concentration and body weight at birth ($r = -0.15$) and weaning weight ($r = -0.12$) for HK and LK pooled data were negative in direction and significantly different from zero ($p < 0.05$).

Mean value for fleece weight, fiber diameter, fiber length, crimps/2cm, percentage modulated fibers, and wax and alkali solubility percentage are presented in Table 3.

Table 3: Potassium type and some wool quality characters

Trait	Type		Level of significance
	HK	LK	
Fleece weight (kg)	20 ± 0.04	1.8 ± 0.07	**
Fiber diameter (μ)	29.6 ± 0.30	28.6 ± 0.31	**
Fiber length (cm)	15.4 ± 0.07	15.2 ± 0.17	
Crimps/2cm	5.2 ± 0.12	5.4 ± 0.12	
Medullation%	6.6 ± 0.55	6.1 ± 0.65	
Wax%	2.2 ± 0.07	1.8 ± 0.05	**
Alkali solubility %	7.6 ± 0.27	7.1 ± 0.22	**

** $p < 0.01$

Fleece weight, fiber diameter, alkali solubility, and wax content were all significantly higher ($p < 0.01$) for HK wool. Phenotypic correlations between potassium (pooled HK and LK data) concentration and fleece weight, fiber diameter, and crimps/2cm were significantly different from zero ($r = 0.19, 0.26$ and -0.24 , respectively). Other correlations were positive, but not significant ($p < 0.05$).

4. Discussion

The study showed about 95% of Awasi sheep which is the most important and largest breed of sheep in Iraq were HK type despite the fact that this trait is recessive from our perspective its due to the a property of this allele to resist harsh weather conditions as well as some different diseases this phenomena at the expense of some high qualities of productivity; like twin percentage and wool quality which is provided by LK trait, It is clearly evident from the foregoing that it is possible to adoption of the level of potassium concentration to elect breed or even sub breed of sheep that has a high productivity and reproductively, taking into consider-

ation the that we can select the sheep for breeding within two months of age because the level of potassium concentration in red blood cells fixed in this age.

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 HK types among groups of Awasi sheep.

This raises the question as to whether such genes 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 types. Alternatively is the result due to random genetic drift which is expected to occur in small populations such as in the present flock? 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.

In a study conducted earlier, Evans [25] found the frequency of HK genes was about 0.95 for Iraqi Awasi sheep. The present estimate falls within the 95% confidence interval of that of Evans.

When the expected change gene frequency in 1 generation is calculated [23], allowing selection to work against the dominant allele (LK), or favors the recessive and “q” to be = 0.9 and $s = 0.1$, the resultant value is about 0.008. 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 other alleles (LK) will remain in the population for many generations.

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