Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 6, Issue, 11, pp.10232-10235, November, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

FACTORS AFFECTING SHEEP PRODUCTION AND REPRODUCTION

Al-Samarrae, S. H. and *Anas A. Humadi

College of Veterinary Medicine, Diyala University, Iraq

ARTICLE INFO

Article History:
Received 10th August, 2014
Received in revised form
23rd September, 2014
Accepted 17th October, 2014
Published online 30th November, 2014

Key words:
Sheep, Factors affecting (potassium), Production and Reproduction.

ABSTRACT

Group of animal consist of 300 Awassi ewes, 32 rams and 322 off spring were typed for blood potassium and hemoglobin , HK gene frequencies for ewes, rams, and lambs were of the order of 0.89, 0.93 and 0.88, respectively; for the HbB gene the corresponding frequencies were related 0.98, 1.00 and 0.99, respectively. B HK (High potassium, Hb type B) ewes showed a significantly higher lambing percentage, fleece weight, fiber diameter, fleece wax percentage and alkali solubility percentage, 98.5%, 20kg, 29.6µ, 2.2% and 7.6% corresponding with related 95.5%, 1.8kg, 28.6µ, 1.8% and 7.1% of B LK type respectively. B LK (Low potassium, Hb type B) ewes produced significantly more female lambs while B LK lambs, compared with B HK ones, had significantly higher birth and weaning weights. The association between B HK types and fitness was proposed as the explanation of the high gene frequency of this type.

INTRODUCTION

The association of Some blood biochemical polymorphism which associated of production and reproduction traits in sheep has been investigated by many workers in several countries (Evans *et al*., 1955; Erkoc *et al*., 1987; Reddy *et al*., 1990; Nihat *et al*., 2003; Shaharbabak *et al*., 2006; Nedjar-Arroume *et al*., 2008; Shaharbabak *et al*., 2009 and Gurcan *et al*., 2010). The most important of these differences is the biochemical concentration of potassium level and quality of hemoglobin and concentration of copper in the blood of sheep, and research has extended to include the level of protein in the blood serum. It began to study the element potassium since 1954 (Evans *et al*., 1955) where they indicated the existence of two types of potassium concentration in the blood of sheep and controlled genetically by a pair of alleles on the same locus give rise to two type of potassium concentration high potassium (HK) which is a homozygous recessive trait and low potassium (LK) which is dominant trait and its genotype either homozygous or heterozygous (Evans *et al*., 1955).

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" (Schreiber and Prosi, 1988; Mohri *et al*., 2005; Al-Samarrae, 2006; Salako *et al*., 2007; Shaharbabak *et al*., 2007; Jiang *et al*., 2008; McManus *et al*., 2009 and Akinyemi *et al*., 2010).

Corresponding author: Anas A. Humadi,
College of Veterinary Medicine, Diyala University, Iraq.

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 Awassi 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.

MATERIALS AND METHODS

This study was conducted in middle part of Iraq / Abu-Ghraib, on a pure Awassi sheep breed and their offspring, blood sampling start from January 2002 till March of 2002, fleece weight had been taken directly after fleecing process in May of the same year. Some 280 ewes, 32 rams and 322 of their lambs were sampled for blood potassium and haemoglobin type (and a further 60 ewes in the case of Hb). The sheep were maintained on a private farm near Baghdad 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 were identified to sire and the records used to study the mode of inheritance of blood potassium and haemoglobin types. The flock in which these animals were kept was designated as the 'Registered flock or group'. Random blood samples were collected from Awassi sheep from many localities and flocks. These sheep were regarded as being reasonably representative of the local Awassi breed. Blood potassium (m-equiv. K/l RBC's) was determined by the use of an atomic absorption spectrophotometer (240 Mark 2, Evans, England). And the concentration was determined according to Dawsan *et al.* (1968). As shown in figure 1

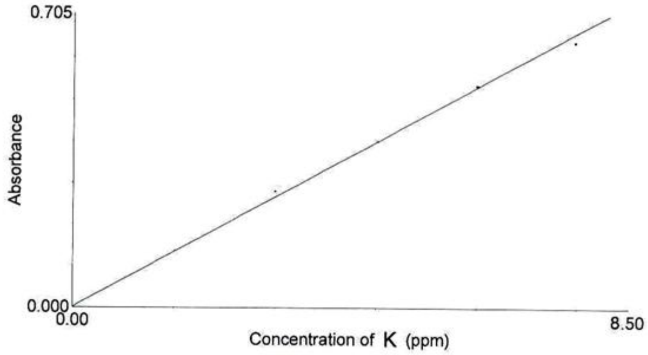

Figure 1. The standard curve of potassium ion

Gene frequencies of potassium type was calculated according to the method of Falconer (1960). 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 (1968).

RESULTS

Frequency and inheritance of Potassium and Haemoglobin types

The results showed that 80% of the ewes, 77% of their lambs and 78% of the rams were of high potassium (HK) type. For haemoglobin type B 96, 97 and 100% of ewes, lambs and rams, respectively were of HbB type. The remainder of the ewes and lambs were of HbAB type. There was no clear line of demarcation between HK and LK potassium types in ewes and lambs as some 5% of those typed were intermediate. Rams were clearly separated into HK (High potassium) and LK (Low potassium) types. Among all animals sampled HK (High potassium) and LK (Low potassium) and HbB gene frequencies were very high (Table 1).

Table 1. Distribution of potassium and haemoglobin types and the appropriate gene frequencies for the register Awassi flock

Animals	Potassium types			Haemoglobin types		
	HK	LK	HK gene frequency	B	AB	B gene frequency
Ewes	224	56	0.98	330	12	0.98
Lambs						
Observed	247	75	0.88	313	9	0.99
Expected	257.6	64.4		310.7	11.3	
Rams	28	4	0.93	32	0	1.00

There was no significant difference between gene frequencies of the ewes and their lambs, or between observed and expected phenotype frequencies among the lambs. Analysis of the mating types showed the same mode of inheritance for K and Hb blood types as that reported by may authors (Evans *et al.*, 1955; Khattab *et al.*, 1964; Taneja, 1972 and Stein *et al.*, 1987). When the ewes were distributed among 4 age groups (Table 2) there was no significant difference in mean potassium concentration of HK and LK types (within B-type haemoglobin). Differences in HK and HbB gene frequencies between different age groups, were within the expected sampling error.

Table 2. Mean potassium level (m-equiv. K/l red blood cells) in the HK and Lk types together with gene frequencies of HK and HB B for different age groups in ewes

(Means and standard errors)

Age (years)	Potassium concentration		Gene frequency	
	HK	LK	HK	Hb B
2	48.84±1.52	15.11±1.90	o.92 (44)[1]	0.98 (62)
3	49.64±1.20	15.46±1.19	0.85 (77)	0.98 (102)
4	51.47±1.30	13.21±0.64	o.90 (67)	0.98 (86)
5	49.80±1.41	13.20±1.04	0.90 (62)	0.98 (92)

[1] *number of animals in parentheses*

For the purpose of comparison, HK and HbB gene frequencies were calculated for the random sample of the sheep and found to be 0.91 and 0.98, respectively. These values did not differ from those of the registered flock.

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), twining percentage, female lambs born percentage and mortality percentage were calculated on a within potassium and hemoglobin-type basis. Figures given in Table 3 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 3. Potassium and haemoglobin types and some aspects of reproduction and growth in Iraqi Awassi sheep

Trait	Type				Level of significance
	HK		LK		
	BB	BB&AB	BB	BB&AB	
Fertility%	84.3		79.2		
Lambing%	98.2	83.9	84.9	80.2	1,2,3,4 **
Twining%	19.1	95.5	7.1	85.7	
Mortality%	3.3	18.6	0	6.7	
Female crop%	1.7%	3.6	60.0%	0	**
Body wt. at Birth(kg)	4.60		4.89		*
Weaning(kg)	19.9		20.8		*

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

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 = -o.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 modullated fibers, and wax and alkali solubility percentage are presented in Table 4. 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, put not significant ($p>0.05$).

Table 4. potassium type and some wool quality characters (within Hb B type)

Trait[1]	Type 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	**

*1 100 observation per trait. ** p<0.01*

DISCUSSION

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 Awassi 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 such as the present registered 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.

The very close and high HK and HbB gene frequencies (0.91 and 0.98, respectively) found in the random sample to those in the registered flock, despite the former coming from a large number of flock and regions, must exclude random genetic drift and or artificial selection as major causes of such frequencies. Again the low intensity of artificial selection practiced in the registered flock (with only about 1% culling) could not product such a result. 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*. (1958) found the frequency of HK and HbB genes was about 0.95 for Iraqi Awassi sheep. The present estimate falls within the 95% confidence interval of that of Evans *et al*. (1958). When the expected change gene frequency in 1 generation is calculated (Falconer, 1960), 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.

Change in gene frequency $\Delta q = \frac{sq^2-(1-q)}{1-s(1-q^2)}$

$$\Delta q = \frac{0.1x0.8x0.1}{1-0.1(1-0.8)} = 0.008$$

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 2 other alleles (LK and HbA) will remain in the population for many generations.

REFERENCES

Evans, J.V. and J.W. King, 1955. living Barbary sheep Ammotragus lervia. Comp. Biochem. Physiol. A.; 89(1):75-7. Genetic control of sodium and potassium concentration in the red blood cells of sheep. *Nature Lond.,* 176:171.

Erkoc, F.U.; Z.N. Alparslan, and E. Ugrar. 1987. Red blood cell potassium types of Angora goats. *Comp. Biochem. Physiol.,* 87 (1):9-11.

Reddy, V.R.C., V.P. Reedy and K.K. Reddy. 1990. Distribution of blood potassium types and their relationship with growth traits in Nellore and Nellore x Dorset Half-Bred sheep. *Ind. Vet. J.,* 420-424 .

Nihat, M., G. Handen and A. Velat. 2003. Correlation between biochemical parameters and production Traits in Merino crosses sheep. Haemoglobin and Transferrin types. *Turk. J. Vet. Anim. Sci.,* 27:575-581.

Shaharbabak, H. M., M. M. Shaharbabak and G. H. Rahimi. 2006. Whole blood potassium polymorphism with other blood electrolytes of Kermani Sheep in Iran. *International Journal of Agriculture and Biology,* 1560-8530-6-763-765.

Nedjar-Arroume, N. , V. Dubbois-Deival, Y.E. Adje, J. Traisnel, F. Krier, P. Mary, M. Kouach, G. Briand and D. Guillochon. 2008. Bovine hemoglobin: an attractive source of antibacterial peptides. *Peptides,* 29(6):969-77.

Shaharbabak, H. M., M. M. Shaharbabak, G. H. Rahimi and H. M. Yeganeh. 2009. Association of the whole blood potassium polymorphism with resistant to Saline in two sheep of different climates of Iran. Desert (Biaban); 14(1):95-99.

Gurcan, E. K., C. Erbas and O. Cobanoglu. 2010. Biochemical polymorphism of erythrocyte potassium and glutathione protein: The relationship with some blood parameters in Kivircik sheep breed. *African Journal of Agricultural Research*, vol. 5(10):1022-1027.

Schreiber, A. and F. Prosi. 1988. Evidence of loss of a suggested genetic polymorphism in the blood potassium contents of Zoo-living Barbary sheep Ammotragus lervia. *Comp. Biochem. Physiol. A.,* 89(1):75-7.

Mohri, M., A.A. Jannatabadi and M.R. Aslani 2005. Studies on haemoglobin polymorphism of two breeds of Iranian sheep and its relationship to concentrations of iron, copper, haemoglobin, haematocrit and RBC number. *Vet. Res. Commun.,* 29 (4):305-12.

Al-Samarrae, S.H. 2006. Potentiality employment of some hematological and biochemical criterions for evaluation of productivity performance traits of Iraqi sheep. Ph.D. Thesis, University of Baghdad.

Salako, A. E., T. O. Ijadunola and Y. O. Agbesola. 2007. Hemoglobin polymorphism in Nigerian indigenous small ruminant populations-preliminary investigation. *African Journal of Biology,* Vol. 6 (22), pp2636-2638.

Shaharbabak, H. M., M. M. Shaharbabak and H. M. Yeganeh 2007. Whole blood potassium polymorphism and other blood electrolytes of Varamini Sheep in Iran. International *Journal of Agriculture and Biology*, 1560-8530-1-84-86.

Jiang, C. , X. Wang, W. Gago, W.Y. Peng, J.X. Xie and Y.J. Li. 2008. Kinetic of hemoglobin carrying and releasing oxygen. Sheng Li Xue Bao.

McManus, C. , G.R. Paludo, H. Louvandini, R. gugel, L.C. Sasaki and S.R. Paiva 2009. Heat tolerance in Brazilian sheep: physiological and blood parameter. *Trop. Anim. Health prod.,* 41(1):95-101.

Akinyemi, M. O. and A. E. Salako. 2010. Hemoglobin polymorphism and Morphpmetrical correlates in the West African Dwarf Sheep of Nigeria. *Int. J. Morphol.,* 28(1):205-208.

Dawsan, J.B., D.J. Ellies, and J.T.S. Newton. 1968. Direct estimation of copper in serum and urine by atomic absorption spectroscopy. *Clin. China. Acta.*, 21:33.

Falconer, D. S. 1960. Introduction to quantitative genetics. Oliver and boyd, Edinburgh, Scotland.

Snedecor, G. W. and W. G. Cochran. 1968. Statistical methods. Iowa State Univ. Press, Ames, Iowa, USA.

Khattab, A.G.H., J.H. Watson and R.F.E. Axford. 1964. Genetic control of blood potassium concentration in Welsh Mountain sheep. *J. Agric. Sci. Camb.,* 63:81_84.

Taneja, G.C. 1972. Genetic control and adaptive significance of blood potassium types in some indigenous and exotic breeds of India. *Anim. Breed. Abstr.*, 42(5):207.

Stein, J.M., E.M. Tucker, J.C. Elloory and L. Kilgour. 1987 L-antigen and active potassium transport in HK and LK red cells of Barbary sheep Ammotragus Iervia. *Comp. Biochem. Physiol.,* A.; 87(3):711-6.

Evans, J.V., H. Harris, and F.L. Warren. 1958. Haemoglobin and potassium blood types in some non-British breeds and in certain rare British breeds. *Nature. Lond.,* 182 : 320-321.

****