

## Hair as indicator of mineral status in Yankassa sheep.

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### RÉSUMÉ

KUMARESAN (A.), KAPIOH (M. A.). Le poil en tant qu'indicateur de la concentration en sels minéraux chez le mouton Yankassa (Nigéria). *Rev. Elev. Méd. vét. Pays trop.*, 1984, 37 (1) : 61-64.

Douze brebis de race Yankassa en bonne santé ont été réparties en deux classes d'âge : moins d'un an et plus de deux ans.

Des échantillons ont été prélevés en cinq points (encolure, coude, flanc, cuisse et queue). La concentration des poils en macro- et micro-éléments a été analysée et a donné les moyennes suivantes exprimées en millièmes :

	moins d'un an	plus de deux ans
Sodium	267,9	151,6
Potassium	246,5	288,2
Calcium	776,3	694,8
Magnésium	145,8	134,4
Fer	7,30	7,72
Zinc	156,6	163,3

La concentration pilaire du sodium et du calcium était plus élevée chez les moutons de moins d'un an que chez les moutons de plus de deux ans. Par contre, il n'y avait aucune différence significative dans la concentration des autres éléments.

Le taux de potassium était significativement plus élevé dans les échantillons prélevés sur la cuisse que sur la queue, ce qui n'a pas été observé aussi bien dans les autres localisations que pour les autres minéraux.

**Mots clés :** Poil - Concentration - Sels minéraux - Mouton Yankassa - Nigéria.

### SUMMARY

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Twelve healthy female Yankassa sheep were divided into two age groups as below one year and above two years. Five locations of the body (neck, elbow, flank, thigh and tail) were demarcated to collect the hair samples. Macro and micro-elements concentrations of hair were estimated. Mean sodium, potassium, calcium, magnesium, iron and zinc were 267.9, 246.5, 776.3, 145.8, 7.30, 156.6 and 151.6, 288.2, 694.8, 134.4, 7.72, 163.3 parts per million in sheep below one year and above two years of age respectively. Sheep below one year of age contained more hair sodium and calcium than animals above two years. There were no significant differences between the concentrations of other minerals. Potassium levels were significantly higher in the hair samples of thigh region than tail. This observation was not seen with other locations as well as with other minerals.

**Key words :** Hair - Concentration - Minerals - Yankassa sheep - Nigeria.

### INTRODUCTION

Mineral deficiencies in sheep would lead to low productivity, delayed maturity and poor reproductive performances (3). Normally the mineral deficiencies of animals are diagnosed

by analysing the mineral levels of blood serum, urine and organs like liver and bones (7, 1). Recently it has been proposed that body stores of minerals may be estimated from hair analysis because growing hair is metabolically active and is a sequestering tissue. Therefore

hair may reflect concentrations of minerals that were in the hair follicle at the time the hair was formed (2). In addition, it may be collected easily with little trauma and can be stored until analysis is convenient because it does not deteriorate readily.

The objective of this study was to determine normal mineral concentrations of the hair and the influence of age and body location on the mineral content of hair obtained from Yankassa sheep indigenous to northern Nigeria.

## MATERIALS AND METHOD

Twelve healthy female Yankassa sheep were selected and divided into two groups as below, one year and above two years of age. All animals were allowed to graze from 8.00 a.m. to 1.00 p.m. daily and they were housed in a shed after grazing. At night, these animals were supplemented with hay and wheat offals. Water was provided *ad libidum*.

Hair samples were collected from neck, elbow, flank, thigh and tail regions. Each area was thoroughly groomed to remove foreign materials and the hair was clipped using a pair of stainless steel scissors. Approximately one gram of each sample was weighed in a clean crucible. They were washed well with deionized water without loosing the samples. Then the samples were dried in a hot air oven for 18 to 24 hours at 60 °C. After determining the dry-matter, complete ashing was done by placing them at 550 °C for 24 hours in a muffle furnace. Thus the ash content of each sample was calculated. Concentrated hydrochloric acid (3 ml) was added to the ash and

evaporated to dryness over a water bath. Nitric acid (5 ml, 10 p. 100) was then added and the solution filtered in a fifty milliliters volumetric flask. The filtrate was made up to mark with deionized water. All minerals were estimated using appropriate dilutions. Precautions were being taken to avoid mineral contaminations in all stages of operation.

Analysis of sodium, potassium and calcium were carried out in a flame photometer using respective filters (Gallen Kamp). Concentrations of magnesium, iron and zinc were estimated by atomic absorption spectrophotometer at 285, 248 and 313 nm respectively (Perkin Elmer 360 B). Statistical analysis was done by Student t-test, according to the method given in SNEDECOR and COCHRAN (6).

## RESULTS AND DISCUSSION

Results of percentage of dry-matter and ash content of hair samples from Yankassa sheep are shown in table 1. The mean percentage of dry-matter and ash content were 81.2, 3.68, and 77.5, 4.16 in sheep below one year and above two years of age respectively. Normally white hair would contain less percentage of ash content than pigmented hair. Though the hair colour of Yankassa sheep was white, the ash contents were higher than the levels quoted in the literature (5, 8).

Macroelements and microelements concentrations of hair samples obtained from two age groups of sheep in various locations of the body are given in tables 2 and 3 respectively. Higher concentrations of sodium and calcium were obtained in young animals (below one year of age) than above two years of age and the

TABLE 1-Percentages of dry-matter and ash content of Yankassa sheep's hair samples

Body locations	Dry - matter		Ash Content	
	Age groups		groups	
	Below one year	Above two years	Below one year	Above two years
Neck	83.5	87.9	3.6	4.2
Elbow	82.2	68.5	3.7	4.2
Flank	81.0	76.8	3.8	4.2
Thigh	76.0	72.2	3.6	4.1
Tail	83.4	81.9	3.7	4.1

TABLE 2-Macroelement concentrations of hair samples of Yankassa sheep (Mean  $\pm$  SE) (n = 6)

Body locations	Below one year of age				Above two years of age			
	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>++</sup>	Mg <sup>++</sup>	Na <sup>+</sup>	K <sup>+</sup>	Ca <sup>++</sup>	Mg <sup>++</sup>
	(in parts per million)							
Neck	244.8 $\pm$ 7.3	227.3 $\pm$ 8.8	760.4 $\pm$ 16.9	144.1 $\pm$ 3.2	152.6 $\pm$ 12.5	262.6 $\pm$ 28.1	698.6 $\pm$ 17.2	138.3 $\pm$ 3.9
Elbow	283.0 $\pm$ 26.6	234.3 $\pm$ 9.4	773.6 $\pm$ 15.0	147.1 $\pm$ 5.8	145.0 $\pm$ 8.9	303.6 $\pm$ 37.8	714.0 $\pm$ 14.9	135.7 $\pm$ 2.7
Flank	282.1 $\pm$ 19.6	239.7 $\pm$ 25.4	781.2 $\pm$ 25.2	143.2 $\pm$ 4.8	164.3 $\pm$ 11.4	286.3 $\pm$ 40.6	685.3 $\pm$ 19.3	138.2 $\pm$ 2.6
Thigh	269.4 $\pm$ 12.9	268.2 $\pm$ 21.5	788.8 $\pm$ 29.5	150.5 $\pm$ 7.2	151.6 $\pm$ 8.7	329.3 $\pm$ 19.9	694.6 $\pm$ 9.8	136.2 $\pm$ 3.2
Tail	260.3 $\pm$ 14.9	262.8 $\pm$ 18.9	777.3 $\pm$ 12.1	144.1 $\pm$ 5.2	145.3 $\pm$ 10.4	259.0 $\pm$ 14.5	681.3 $\pm$ 18.7	138.7 $\pm$ 3.2

TABLE 3-Microelement concentrations of hair samples from Yankassa sheep (Mean  $\pm$  SE) (n = 6)

Body locations	Below one year of age		Above two years of age	
	Iron	Zinc	Iron	Zinc
	(in parts per million)			
Neck	6.54 $\pm$ 2.31	157.84 $\pm$ 9.41	7.64 $\pm$ 0.95	160.00 $\pm$ 8.90
Elbow	7.52 $\pm$ 0.69	153.00 $\pm$ 12.53	7.94 $\pm$ 1.50	177.50 $\pm$ 8.44
Flank	8.17 $\pm$ 1.17	162.00 $\pm$ 8.56	8.43 $\pm$ 1.00	162.00 $\pm$ 7.02
Thigh	7.27 $\pm$ 0.54	156.12 $\pm$ 13.43	7.35 $\pm$ 0.78	143.00 $\pm$ 10.72
Tail	7.10 $\pm$ 0.50	154.21 $\pm$ 10.02	7.22 $\pm$ 0.59	173.83 $\pm$ 11.95

differences were highly significant ( $P < 0.01$ ) (Table 4). Similar finding was recorded by O'MARY *et al.* (5) in Hereford cattle. But the above authors also found significant differences in hair potassium between Hereford cows and calves. This was not reflected in our studies with sheep. A parallel study with goats from our laboratory showed higher concentrations of calcium in young animals than adult animals (unpublished data). This clearly indicates that young animals have more hair calcium than adult animals (Tables 2, 3 and 4).

Pigmented hair contains more minerals than white hair of animals (5). As we indicated already the hair samples of Yankassa sheep were white in colour, one could expect lower concentrations of minerals than pigmented hair. This was true with our results.

Mineral content of hair samples collected from different locations of the body were compared (Table 4). Among the macroelements,

potassium was significantly higher ( $P < 0.05$ ) in the samples of thigh than tail regions in animals above two years of age. All other mineral

TABLE 4-Level of significance in the mineral concentrations between age groups and body locations

Element	Between age groups	Body locations
		Above two years of age
		Thigh Vs Tail
Sodium	S <sup>***</sup>	NS
Potassium	NS	S <sup>**</sup>
Magnesium	NS	NS
Calcium	S <sup>***</sup>	NS
Iron	NS	NS
Zinc	NS	NS

S<sup>\*\*</sup> =  $P < 0.05$  ; S<sup>\*\*\*</sup> =  $P < 0.01$ .

levels of hair sample obtained from various body locations were not significant. Differences in mineral concentrations of hair samples given by various authors may be partly due to the different

analytical procedure followed by them. Concerning the trace-element, there is always higher chances of contamination though adequate precautions might have been taken (4).

#### RESUMEN

KUMARESAN (A.), KAPIOH (M. A.). El pelo como indicador de la concentración de sales minerales en el carnero Yankassa (Nigeria). *Rev. Elev. Méd. vét. Pays trop.*, 1984, **37** (1) : 61-64.

Se agruparon doce ovejas de raza Yankassa de buena salud según dos clases de edad : menos de un año y más de dos años.

Se tomaron muestras en cinco sitios (cuello, codo, ijada, pierna y cola). La concentración de los pelos en macro y micro-elementos fué analizada y dió las medias siguientes expresadas en millonesimas.

	menos de 1 año	mas de 2 años
Sodio	267,9	151,6
Potasio	246,5	288,2

Calcio	776,3	694,8
Magnesio	145,8	134,4
Hierro	7,30	7,72
Cinc	156,6	163,3

Era más elevada la concentración pilosa del sodio y del calcio en los carneros de menos de un año que en los de más de dos años.

En cambio, no se notaba ninguna diferencia significativa en la concentración de otros elementos.

La proporción de potasio era significativamente más elevada en las muestras tomadas a partir de la pierna que de la col, lo que no fué observado tanto en los demás sitios como en lo concerniente a los demás minerales.

*Palabras claves* : Pelo - Concentración - Sales minerales - Carnero Yankassa - Nigeria.

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