

## **PROTEIN, CARBOHYDRATE AND CALCIUM CONTENT IN MEAT OF DIFFERENT BREEDS OF SHEEP IN BALOCHISTAN.**

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**Abstract:** Total protein, carbohydrate and calcium contents were estimated in the meat samples of 11 varieties of sheep slaughtered at Quetta. In an order from highest to the lowest proportion neat protein content was  $22.4 \pm 0.63\%$  in Michni,  $21.1 \pm 0.92\%$  in Balochi,  $21.0 \pm 0.64\%$  in Hashtnagri,  $20.6 \pm 0.42\%$  in Harnai,  $20.5 \pm 1.09\%$  in Karakul,  $20.1 \pm 0.91\%$  in Dumbi,  $19.8 \pm 0.61\%$  in Lohi,  $19.8 \pm 0.95\%$  in Bibrik,  $18.7 \pm 1.03\%$  in Kacchi,  $18.5 \pm 0.91\%$  in Rakhshani and  $17.7 \pm 0.53\%$  in Waziri breeds. Significant differences have been found in protein, carbohydrate, and calcium contents in these breeds. Sheep varieties under study have an average lower meat protein contents compare to goat, cow meat in the city.

The highest carbohydrate concentration was observed in Karakul, in general ( $0.52 \pm 0.05\text{mg/g}$ ), followed by  $0.51 \pm 0.05$ ,  $0.50 \pm 0.05$ ,  $0.49 \pm 0.04$ ,  $0.48 \pm 0.03$ ,  $0.45 \pm 0.03$ ,  $0.45 \pm 0.44$ ,  $0.44 \pm 0.04$ ,  $0.41 \pm 0.06$ ,  $0.38 \pm 0.03$  and  $0.38 \pm 0.02$  in Balochi, Harnai, Michnio, Dumbi, Bibrik, Kacchi, Hashtnagri, Lohi, Rakhshani and Waziri, respectively. In goat and cow there were noticeable lower content compare to sheep as well as poultry tissue. Significant difference have been found among the compared groups.

Calcium content was  $96.0 \pm 2.10$ ,  $84.0 \pm 2.5$ ,  $83.1 \pm 3.99$ ,  $77.5 \pm 4.5$ ,  $74.6 \pm 5.23$ ,  $72.8 \pm 4.6$ ,  $68.8 \pm 2.3$ ,  $67.7 \pm 2.8$ ,  $67.4 \pm 7.4$  and  $67.0 \pm 1.8 \mu\text{g/g}$  in Michni, Dumbi, Rakhshani Balchohi, Harnai, Bibrik, Waziri, Kacchi, Hashtnagri, Karakul and Lohi, respectively. The highest concentration of calcium has been found in poultry compared to sheep, the goats and the cows. Significant differences in mineral content among the different groups have been observed.

**Key words:** Sheep, breeds, meat, protein, carbohydrate and calcium.

### **INTRODUCTION**

Meat is a good source of protein, readily available iron, calcium, magnesium, selenium, zinc and a range of B-vitamins (Hill, 2002). In the areas of different climate and topographical conditions the meat source of animals depends upon availability vegetation of specific nature. Thus the composition of the meat changes noticeably (Haenlein, 2001). The importance of protein is indispensable, however, the principal constituents other than protein of meat are also important for public health. Calcium plays vital role in the chemical balance hormonal homeostasis and many other metabolic processes such as skeletal integrity (Adeloye and Akinsoyine, 1984; Navch-Mand and Justin, 1990), muscular contraction and relaxation, blood pressure regulation and many reproductive processes. Calcium in circulation is index of the inter-relationship of hormones like parathyroid hormone and calcitonin (Furlanetto et al., 1990). Calcium contributes to the progression of epithelial cells through all phases of the proliferative cycle and into stages of cell differentiation (Newmark and Lipkin, 1992). Simple carbohydrates in muscle are less than 1%, glucose and glycogen are concentrated in

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the liver (Cheema et al., 1993). Hessein et al., (1991) suggested that feeding fish meal (FM) with barley, which is high in both degradable carbohydrate and protein, might benefit ruminants more than feeding FM with corn, which is high in degradable carbohydrates but relatively low in degradable protein.

Balochistan, a vast area of nomadic sheep and goat farming not only provides these as meat source locally but are exported to other provinces and abroad. The analysis of the meat source animals of Balochistan is imperative to assess its quality. It will contribute in the promotion of its meat market. Thus present study is carried out to analyze the meat samples of various breeds of sheep in Balochistan.

## **MATERIALS AND METHODS**

Meat samples (approximately 100g excised from five different parts, i.e., upper part of hind limb, fore limb, shank, neck and ribs, were collected within 10 minutes of slaughtering, from 85 sheep (9-11 month old). Eleven breeds of sheep were selected for meat samples (Waziri, Balochi, Bibrik, Karakul, Rukhshani, Kacchi, Dumbi, Michni, Lohi, Harnai, and Hashtnagri). Slaughtering was done by professional butchers of the slaughter house situated at Kawari Road, Quetta. Each of the samples was individually packed in bags, labeled with date, time, and name of breed, sex and age and then kept in icebox. At laboratory the collected samples were stored in a freezer at  $-18^{\circ}\text{C}$  till used for chemical analysis. The meat samples of goat (10), cow (10) and broiler (10) were also collected for the comparison.

Total meat protein was estimated by Biuret method (Cheesbrough, 1981) after digestion of the samples. Digestion of muscle was done in 0.3N KOH at  $37^{\circ}\text{C}$  for about 48 hours. Appropriate dilution of the samples was done by distilled water.

Glycogen was estimated by the modified method of (Roe and Daily, 1966). Tissue glycogen was determined from the homogenate prepared in 5% TCA. The glycogen was precipitated in the homogenate with 95% ethanol. The precipitated glycogen was estimated directly with anthrone reagent.

Calcium estimation was done by Methylthymol Blue method from the homogenates of meat samples (Cheesbrough, 1981). The homogenates were prepared in phosphate buffer at pH 7.2.

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## RESULTS

### *Carbohydrates*

Carbohydrates contents ranged between  $0.38 \pm 0.03$  to  $0.52 \pm 0.05$  mg/g meat sample of the different varieties of the sheep. The highest concentration was observed in Karakul ( $0.52 \pm 0.05$ mg/g), followed by  $0.51 \pm 0.05$  mg/g in Balochi,  $0.50 \pm 0.05$ mg/g in Harnai,  $0.49 \pm 0.04$ mg/g in Michni,  $0.48 \pm 0.03$  mg/g in Dumbi,  $0.45 \pm 0.03$  mg/g in Bibrik,  $0.45 \pm 0.04$  mg/g in Kacchi,  $0.44 \pm 0.04$  mg/g in Hashtnagri,  $0.41 \pm 0.06$  mg/g in Lohi  $0.38 \pm 0.02$  mg/g in Waziri and  $0.38 \pm 0.03$  mg/g in Rakhshani breed.

Harnai, Balochi and Karakul have shown more than 0.50 mg/g of carbohydrate contents in meat compare to other breeds with lower amount of the fraction. Significant differences of the fraction have also been demonstrated among certain breeds.

An overall average content of carbohydrates have been found to be  $0.44 \pm 0.038$  mg/g tissue in all breeds of the sheep. In comparison the fraction content did not vary considerably in poultry with concentrations of  $0.44 \pm 0.03$  mg/g tissue. In goats and cows however, the fraction contents were significantly lower at concentrations of  $0.31 \pm 0.04$  mg/g,  $0.29 \pm 0.02$  mg/g, respectively.

### *Total Protein*

Total protein content in the meat muscle varied from 17.7% to 22.4% in the different varieties of the sheep studied. In an order from highest proportion to the lowest there was  $22.4 \pm 0.63\%$  in Michni,  $21.1 \pm 0.92\%$  in Balochi,  $21.0 \pm 0.64$  in Hashtnagri,  $20.6 \pm 0.42\%$  in Harnai,  $20.5 \pm 1.09\%$  in Karakul,  $20.1 \pm$  in Dumbi,  $19.8 \pm 0.61\%$  in Lohi,  $19.8 \pm 0.95\%$  in Bibrik,  $18.7 \pm 1.03\%$  in Kacchi,  $18.5 \pm 0.91$  in Rakhshani and  $17.7 \pm 0.53\%$  in Waziri. Among eleven varieties six varieties have been found to possess more than 20% protein content in their meat samples.

In general, average protein content in the sheep varieties have been found to lower than goat, poultry and cow. These were  $21.1 \pm 1.19\%$  in the goat,  $22.1 \pm 0.55\%$  in the cow and  $21.6 \pm 0.55\%$  in the poultry compared to  $20.1 \pm 0.38\%$  collectively in all the varieties of the sheep.

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## Calcium

The estimated calcium in meat tissue with the method used was ranging between  $67 \mu\text{g/g}$  to  $96 \mu\text{g/g}$  tissue in the different breed of sheep. The highest concentration of the ion was found in Michni breed, where it was  $96.0 \pm 21.0 \mu\text{g/g}$ . it was followed by Dumbi with  $84.0 \pm 2.5 \mu\text{g/g}$ , Rakhshani with  $83.1 \pm 3.4 \mu\text{g/g}$ , Balochi with  $77.5 \pm 4.6 \mu\text{g/g}$ , Harnai  $77.2 \pm 4.5 \mu\text{g/g}$ , Bibrik with  $74.6 \pm 5.3 \mu\text{g/g}$ , Waziri with  $72.8 \pm 4.6 \mu\text{g/g}$ , Kacchi with  $68.8 \pm 2.3 \mu\text{g/g}$ , Hashtnagri with  $67.7 \pm 2.8 \mu\text{g/g}$ , Karakul with  $67.4 \pm 7.4 \mu\text{g/g}$  and Lohi with  $67.0 \pm 1.8 \mu\text{g/g}$ .

High meat calcium content varieties included Michni, Dumbi, and Rakhshani and with lower calcium contents comprised the breeds of Kacchi, Hashtnagri, Karakul and Lohi, with the rest breeds with moderate meat calcium.

Overall average of calcium concentration of  $76.0 \pm 2.6 \mu\text{g/g}$  tissue had been determined in all the breeds of the sheep. In comparison the values were  $70.5 \pm 0.36 \mu\text{g/g}$  in goat,  $71.8 \pm 2.04 \mu\text{g/g}$  in cow and  $92.61 \pm 2.35 \mu\text{g/g}$  in poultry. The greater concentration was observed in poultry and lower in goat and cow when compared with the overall average in the sheep varieties.

Table1. Total protein, carbohydrate and calcium in different breeds of sheep slaughtered at Quetta.

S.No	Breed	N	Carbohydrate (mg/g tissue)	Protein (mg/g tissue)	Calcium ( $\mu\text{g/g}$ tissue)
1.	Michni	06	$0.49 \pm 0.04$	$224.68 \pm 6.3$	$96.00 \pm 2.10$
2.	Lohi	07	$0.41 \pm 0.06$	$198.64 \pm 6.08$	$67.00 \pm 1.83$
3.	Harnai	09	$0.50 \pm 0.05$	$206.40 \pm 4.21$	$77.2 \pm 4.5$
4.	Hashtnagri	07	$0.44 \pm 0.04$	$210.21 \pm 6.39$	$67.71 \pm 2.84$
5.	Bibrik	10	$0.45 \pm 0.03$	$198.71 \pm 9.5$	$74.62 \pm 5.35$
6.	Balochi	11	$0.51 \pm 0.05$	$211.00 \pm 8.25$	$77.50 \pm 4.6$
7.	Dumbi	06	$0.48 \pm 0.03$	$201.20 \pm 9.2$	$84.00 \pm 2.5$
8.	Kacchi	05	$0.45 \pm 0.04$	$187.63 \pm 10.27$	$68.08 \pm 2.87$
9.	Waziri	10	$0.38 \pm 0.02$	$177.49 \pm 5.34$	$72.8 \pm 4.64$

<b>10.</b>	Rakhshani	09	$0.38 \pm 0.03$	$184.91 \pm 9.11$	$83.11 \pm 3.99$
<b>11.</b>	Karakul	05	$0.52 \pm 0.05$	$205.42 \pm 10.90$	$67.44 \pm 7.38$

Table2. Total protein, carbohydrate and calcium in goat, cow and poultry slaughtered at Quetta.

<b>S.No</b>	<b>Type</b>	<b>N</b>	<b>Carbohydrate (mg/g tissue)</b>	<b>Protein (mg/g tissue)</b>	<b>Calcium (<math>\mu</math>g/g tissue)</b>
<b>1.</b>	Goat	10	$0.31 \pm 0.04$	$221.26 \pm 11.90$	$70.50 \pm 0.36$
<b>2.</b>	Cow	10	$0.29 \pm 0.02$	$221.67 \pm 5.54$	$71.8 \pm 2.04$
<b>3.</b>	Poultry	10	$0.44 \pm 0.03$	$216.41 \pm 5.47$	$92.61 \pm 2.35$

## DISCUSSION

The present study provides information particularly about some biochemical characteristics of the meat in several breeds of sheep distributed and farmed in Balochistan. In recent time, with the attempts to meet the gap of animal protein availability i.e. demand and its production, the quality of meat in biochemical characteristics has also become extremely important.

Almost all varieties of sheep, in present study, contain adequate content, however, Michni, Balochi, Hashtnagri, Harnai and karakul have been found to contain more than 20% protein in the meat sample. Keeping in view the arid land of Balochistan, drier pasture lands poorer vegetations, the factors responsible for poorer nutrition for grazing animals, these few varieties in particular and all the varieties in general are well adapted to grow the meat a good proportion of about 20% of protein. These are quite comparable with the protein constituents determined in several types of conventionally and mechanized farmed sheep around the world.

In comparison with other meat source animals sheep meat contained lowest amount of protein. This difference of sheep with poultry and goat may be due to lower lipid contents in the meat of these animals, consequently, the concentration of protein is relatively enhanced.

Carbohydrates content in muscle are more of physiological importance rather than of meat quality. Nevertheless these constituents expound the nutritional status of the animals. Fasting or starving animal, in terms of feed availability or the quality of feed, depletes glycogen and glucose from the muscle (Alvi 1991).

The results of the carbohydrates contents in all the breeds indicate their adequate presence. Thus the sheep, when samples had been taken for the studies, were not in any state of starvation or excessive malnutrition. It is interesting to note that carbohydrates contents of sheep resemble to those of poultry. This characteristic may be related to the low water availability for these animals, poultry being the bird and sheep on the other hand are the inhabitants of arid land areas.

In comparison to the other meat source animals, sheep contain more calcium than goat and cows. Thus, these sheep breeds have the ability to accumulate sufficient calcium from their food. Greater

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concentration of calcium in muscle sample accompanied higher content of muscle protein in Michni breed this relationship, however, was not found to be applicable in other breeds.

It would be of interest to observe the calcium and other micronutrients contents in the pasture, diet etc to assess the adaptability of the different breeds to acquire these from specific vegetations of the area (Cheema et al., 1993).

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