

## Some Physical Characteristics of Coarse Fibre Obtained from Norduz Goat

<sup>1</sup>I. Daskiran, <sup>2</sup>F. Cedden, <sup>3</sup>M. Bingol and <sup>3</sup>Y. Apkın

<sup>1</sup>M.A.R.A., General Directorate of Agricultural Research, Ankara, Turkey

<sup>2</sup>Department of Animal Science, Faculty of Agriculture, Ankara University, Ankara, Turkey

<sup>3</sup>Department of Animal Science, Faculty of Agriculture, Yüzüncü Yıl University, Van, Turkey

**Abstract:** The aim of this study is to investigate some physical characteristics of coarse fibre in Norduz goat which is a local breed of Eastern Anatolia in Turkey. Fibres are sampled from shoulder, thigh and back of 48 female Norduz goat between 1-4 years-old. Fibre length and diameters do not vary significantly according to age and part of body. Fibres obtained from 3 years-old goats are thickest ( $74.4 \pm 6.20 \mu\text{m}$ ) while these from goats one year-old were found thinnest as  $53.7 \pm 2.93$  ( $p < 0.05$ )  $\mu\text{m}$ . Breaking strength value is found higher in 3 years-old goats when comparing with 1 year-old goats ( $18.7 \pm 0.38$  vs  $17.2 \pm 0.27$ ) ( $p < 0.05$ ). Fibre diameter and length is negatively correlated ( $-0.77$ ) ( $p < 0.05$ ) in 3 years-old goats. The diameter and the breaking strength of fibres sampled from back are highly correlated ( $0.94$ ) ( $p < 0.01$ ) in 4 years-old goats. In addition, elongation rate is positively correlated with breaking strength ( $0.88$ ) and diameter ( $0.95$ ) for fibres sampled from back of 4 years-old goats ( $p < 0.01$ ).

**Key words:** Norduz goat, coarse fibre, physical characteristics, Turkey

### INTRODUCTION

The size of Turkish goat population has been estimated to be about 6,780,000 head. In Turkey, goat raising plays an important role in farm animal production. In terms of milk, meat and leather industry, goat production takes, respectively 2.80, 3.50 and 3.91% in total animal production (Kaymakci *et al.*, 2005). Norduz goat is a native goat breed of Eastern Anatolia. This breed is actually distributed throughout 23 villages of an area, called Norduz in Van Province (Daskiran *et al.*, 2004). Its principal coat color is black. It may appear white, cream, black-white pied, grey, ash, roan and brown. The down fibre is collected for kashmir production and used for making blankets, gloves and socks. The coarse fibre is usually preferred for felt tent, floor weaving, saddle-bag and sack production. As observed in fibre production, there is also a great economic regress in coarse hair production, because of decreasing demand to this product in the region. Furthermore, elevated rate of medullary staple restricts the utilization of coarse fibre in the finished fabric, because of stiffness and prickliness (Nicol *et al.*, 1987). It would be necessary to create new fields of utilization for coarse fibre in order to sustain it in the fibre sector. In this study, some qualitative characteristics of coarse fibre, such as diameter, length, breaking strength and elongation percentages were evaluated.

### MATERIALS AND METHODS

The trial was carried out at private farms located in villages of Gurpinar district which is in  $38.2^\circ\text{N}$  latitude and  $43.25^\circ\text{E}$  longitude, above 1745 m of sea level. Mean annual temperature is  $8.8^\circ\text{C}$ , mean rainfall ranging from 386-420 mm and humidity of 60%.

Norduz goats were fed entirely by grazing in pastures and arable fields near villages in spring and summer. Goats were housed in traditional covered pens and fed with hay and cereal straw, during the cold and snowy period of late fall and winter.

Fifty-one female Norduz goats between 1-6 years-old and 45-55 kg of body weight were randomly chosen for fibre sampling. The coarse fibre samples were taken on May, from 3 different body sites, shoulder, back and thigh of goats using clipper for small ruminants.

Fibre diameter and length were measured by Optical-Based Fibre Diameter Analyser UK 100 (USTER O.F.D.A.) (I.W.T.O., 1995). Fibre breaking strength and elongation were measured by Single Fibre Tensile Tester FAFEGRAPH HR + ME referred by ISO, 9001 quality Certificate of EU (A.S.T.M., 1997). Data were analysed by variance analysis and Tukey's pair wise comparisons method (Minitab, 1993). Pearson correlation coefficients among different variables of fibre were calculated using CORR procedure.

## RESULTS AND DISCUSSION

The average fibre length, breaking strength, elongation rate and diameter values of female Norduz goats are shown in Table 1. In this study, age  $\times$  sampling site interaction was found non significant. Also, no significant difference was observed between sampling sites with regard to all fibre traits. But breaking strength, diameter and elongation rate values vary according to age groups. Elongation rate was found highest, while diameter and breaking strength values were lowest for fibre of one year-old goats, unlike to those of 3 years-old goats.

The results of correlation analysis are given as follows: Concerning one year-old goats, it is observed that, the length of staple from back is significantly correlated with breaking strength of those from shoulder (0.43) and staple diameter sampled from back (0.54) ( $p < 0.05$ ). The breaking strength values of shoulder staple and those of back are also significantly correlated (0.56) ( $p < 0.05$ ). In the goats of 2 years-old, the length of staple from back and those from shoulder are significantly correlated only (0.69) ( $p < 0.05$ ).

The staple length from thigh and diameter from those are negatively correlated (-0.77) ( $p < 0.05$ ) with each other for goats of 3 years-old. Some observation are as follows in the group of 4 years-old: The diameter is highly correlated with breaking strength value for staple of back (0.94) ( $p < 0.01$ ). Elongation rate of staples from thigh is highly correlated with breaking strength (0.88) and diameter (0.95) of staples from back ( $p < 0.01$ ). The staple length obtained from back is also correlated (0.83) ( $p < 0.05$ ) with diameter for those obtained from shoulder.

Fibre length provides reliable information on growth rate between shearing times, besides information on suitability of fibre for textile industry. Longer fibres are both resistant and more flexible.

In this study, the length of fibre obtained from back was correlated with breaking strength of staples from shoulder. Longest coarse fibre was obtained from 3 years-old goats, although it was non significant. Recently, average fibre lengths of hair goats from different provinces of Turkey, such as Antalya, Artvin, Diyarbakir, Izmir, Kars and Konya where shearing is practiced usually once a year, were found  $106 \pm 17.4$ ,  $134 \pm 47.6$  and  $106 \pm 29.0$ ,  $125 \pm 35.9$ ,  $104 \pm 19.7$  and  $116 \pm 13.7$  mm, respectively (Koyuncu and Tuncel, 1992). Therefore, the length of coarse fibre was observed lower in Norduz goat than those of hair goat. Fibre diameter value is also related with resistance. Thus, breaking strength was highly correlated with fibre diameter. However, fibre diameters of Norduz goat can be considered as lower compared to those of hair goat. This value was found as  $87.7 \pm 5.30$  and  $88.0 \pm 1.13$   $\mu$ m in hair goats raised in Artvin and Kars respectively, where the lowest fibre diameter values were observed (Dellal, 2001). Dellal *et al.* (2000) reported negative correlation between the diameter and the length of coarse fibre obtained from hair goats of different regions in Turkey. Same author reported a positive correlation in coarse fibre of hair goats raised in Diyarbakir only, whereas the diameter and the length of fibre was found negatively and significantly correlated for 3 years-old goats in our study. Yagin *et al.* (1995) had similar observation for coarse fibre in Liaoning Cashmere goats. A significant positive correlation between the length and the breaking strength value was found only in the fibre of 1 year-old goats. But, only in 4 years-old goats the

Table 1: Average breaking strength diameter elongation rate and fibre length with regard to sampling site and age

Traits	Age	n	Sampling Site (Mean $\pm$ SE Mean)			
			Shoulder	Thigh	Back	General
Breaking Strength (N/ktex)	1	22	16.6 $\pm$ 0.46	18.1 $\pm$ 0.31	17.0 $\pm$ 0.38	17.2 $\pm$ 0.27 <sup>B</sup>
	2	9	18.3 $\pm$ 0.71	17.9 $\pm$ 0.48	18.2 $\pm$ 0.59	18.1 $\pm$ 0.42 <sup>AB</sup>
	3	11	18.4 $\pm$ 0.64	18.4 $\pm$ 0.43	19.3 $\pm$ 0.53	18.7 $\pm$ 0.38 <sup>A</sup>
	4	6	17.6 $\pm$ 0.96	17.8 $\pm$ 0.64	17.2 $\pm$ 0.79	17.5 $\pm$ 0.57 <sup>AB</sup>
	Total	48	17.5 $\pm$ 0.32	18.1 $\pm$ 0.20	17.8 $\pm$ 0.28	17.9 $\pm$ 0.37
Diameter (( $\mu$ ))	1	22	59.8 $\pm$ 3.52	48.7 $\pm$ 4.13	52.6 $\pm$ 6.39	53.7 $\pm$ 2.93 <sup>B</sup>
	2	9	67.7 $\pm$ 5.50	53.9 $\pm$ 6.53	63.5 $\pm$ 6.86	61.7 $\pm$ 4.59 <sup>AB</sup>
	3	11	72.1 $\pm$ 4.98	70.9 $\pm$ 5.90	74.4 $\pm$ 6.20	72.5 $\pm$ 4.15 <sup>A</sup>
	4	6	52.5 $\pm$ 6.74	56.1 $\pm$ 8.00	66.5 $\pm$ 8.40	58.4 $\pm$ 5.61 <sup>B</sup>
	Total	48	63.2 $\pm$ 2.49	55.7 $\pm$ 3.02	61.4 $\pm$ 3.15	60.8 $\pm$ 3.60
Elongation Rate (%)	1	22	25.2 $\pm$ 1.44	23.1 $\pm$ 1.41	25.5 $\pm$ 1.62	24.6 $\pm$ 1.06 <sup>A</sup>
	2	9	20.9 $\pm$ 2.26	19.4 $\pm$ 2.21	19.4 $\pm$ 2.74	18.2 $\pm$ 1.66 <sup>B</sup>
	3	11	23.0 $\pm$ 2.04	24.9 $\pm$ 2.00	23.6 $\pm$ 2.29	23.9 $\pm$ 1.51 <sup>A</sup>
	4	6	19.4 $\pm$ 2.77	21.9 $\pm$ 2.70	26.6 $\pm$ 3.11	22.6 $\pm$ 2.00 <sup>AB</sup>
	Total	48	23.2 $\pm$ 1.00	21.7 $\pm$ 1.07	24.0 $\pm$ 1.12	22.9 $\pm$ 1.31
Fibre Length (mm)	1	22	67.0 $\pm$ 3.45	67.8 $\pm$ 3.18	62.7 $\pm$ 3.41	65.8 $\pm$ 2.45
	2	9	62.9 $\pm$ 5.40	61.9 $\pm$ 5.00	69.4 $\pm$ 5.33	64.7 $\pm$ 3.83
	3	11	73.0 $\pm$ 4.88	76.8 $\pm$ 4.49	73.5 $\pm$ 4.82	74.5 $\pm$ 3.47
	4	6	60.8 $\pm$ 6.61	62.4 $\pm$ 6.08	59.8 $\pm$ 6.53	61.0 $\pm$ 4.49
	Total	48	66.8 $\pm$ 2.34	68.1 $\pm$ 2.22	66.1 $\pm$ 2.35	66.6 $\pm$ 2.93

<sup>A</sup> and <sup>B</sup> denote significant difference ( $p < 0.05$ ) between groups

diameter was found positively and significantly correlated with other three traits of coarse fibre. Unfortunately, there is no reliable information concerning elongation rate value for coarse fibre of goats in Turkey. Average elongation rate was found 33±1% for Kashmir down fibre (Gokmen and Boztepe, 2004). In Norduz goat, this value is highest for fibres of 1 year-old goats (24.6%) and these of 3 years-old goats (23.9%). Goat breeding is still keeping its particular interest for large part of East-Anatolia. Fibre production may provide a subsidiary income, beside the milk and the meat of goat. Researches on fibre traits of goat could provide more information which would be helpful and beneficial in appreciating it, even new ways for valorising other than local use for traditional hand-made products could appear for coarse fibre.

#### REFERENCES

- A.S.T.M., 1997. Annual Book of ASTM Standarts., Vol: 07.01 Textiles (1): D 76-D 3218 (PCN): 01-070197-18, ASTM 100 Barr Harbor Drive, West Conshohocken, PA, USA 19428-2959, ISBN 0-8031-2468-6.
- Dellal, G., 2000. Türkiye’de yetistirilen kıl keçilerinden elde edilen üst ve alt liflerin bazı fiziksel özellikleri arasındaki fenotipik korelasyonlar. *Türk J. Vet. Anim. Sci.*, 26: 189-192.
- Dellal, G., A. Eliçin, F. Soylemezoglu, Z. Erdogan and I.Z. Arık, 2001. Kıl keçilerinden elde edilen üst liflerin bazı fiziksel özellikleri ve kullanım alanları. *Türk J. Vet. Anim. Sci.*, 25: 581-587.
- Daskiran, İ., F. Cedden and M. Bingöl, 2004. Norduz goat of East Anatolia. *J. Anim. Vet. Adv.*, (12): 881-883.
- I.W.T.O., 1995. Specification, Red Book 1995 July. Prepared by the Standardization Sub-Committee and Adopted by the IWTO Technical Committee. IWTO Updates and Additions for current subscribers: May 1996. Published by The International Wool Secretariat Raw Wool Department, Valley Drive, Ilkley, West Yorkshire LS29 8 PB U.K.
- Gokmen, M. and S. Boztepe, 2004. Determination of cashmere fiber production and quality traits in Turkish hair goat. *J. Anim. Vet. Adv.*, 3 (11): 781-784.
- Kaymakci, M., E. Tuncel and O. Guney, 2005. Türkiye’de süt keçisi ıslah çalışmaları. Mayıs Süt keçiciliği Ulusal kongresi, pp: 4-10.
- Koyuncu, M. and E. Tuncel, 1992. Köy koyullarında yetiştirilen kıl keçilerinde kıl verimleri bazı kıl özellikleriyle canlı ağırlık ve vücut ölçüleri arasındaki ilişkiler. Scientific report no: 20, Uludağ Üniv. Fen Bilimleri Ens. Bursa.
- Minitab, 1993. Minitab Reference Manual Released 9 for Windows. July 1993 by Minitab inc.
- Nicoll, G.B., 1987. Genetic parameters and selection policies for fibre characteristics in goats. Proc. 17th Seminar of the Sheep and Beef Soc. N.Z. Vet. Assoc., pp: 38-50.
- Yagin, S., Yongjun, Li., M. Ming, W. Xin and L. Weimin, 1995. Fleece characteristics of Liaoning Cashmere goats. *Fine Fibers News.*, 5: 13-15.