Cashmere Quality of Raeini Goats Kept by Nomads in Iran

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Abstract

This paper assesses the cashmere quality and its variation in Raeini herds to determine the scope for improvement. In April 2010 fleece weights (FW) and midsize fleece samples were taken from a total of 686 male and female cashmere goats of 1, 2 and 3 years of age belonging to 29 herds. The herds were randomly chosen in the summer grazing area of nomads within 20 km of the city of Baft, province of Kerman, South of Iran. Cashmere yield (CY) was determined from the weight of dehaired cashmere to weight of shorn f Cashmere fibers were analyzed using an OFDA instrument. A general mixed linear model including sex, age and sex by age interaction as fixed effects and herd as random effect was used to analyze the data and measure the relationships between different cashmere characteristics and fleece attributes. The overall means ± standard deviations were for fleece weights (FW) 507±183 g, cashmere yield (CY) 56.5±12.2%, mean fiber diameter (MFD) 19.7±1.5 µm, fiber diameter standard deviation (FDSD) 4.5±0.6 µm, fiber curvature (FC) 62.9±8.5 °/mm and staple length (SL) 54.2±7.0 mm, respectively. Herd effect was significant for all traits except for SL and sex by age effect was only significant for MFD. One year old males and females had finer cashmere than older goats. FW and FDSD were higher in males and CY and FC was higher in young animals. Pearson correlation between MFD and FC, FDSD and MFD, MFD and FW was -0.647, 0.399 and 0.211 respectively. Raeini cashmere is white, has an excellent SL and FC but is relatively coarse. Given the differences between and within herds there seems to be substantial scope to improve the commercial value of Raeini cashmere.

Key words: fiber curvature, fiber diameter, fleece weight, staple length

Introduction

40% of the 25 million goat population in Iran is kept by nomads in a habitat of about 59% of the total area of the country (Ministry of Agriculture, 2004). Iran together with Afghanistan is the third largest producer and exporter of cashmere in the world, after China and Mongolia (FAO, 2009). More than 50% of the Iranian cashmere is produced by Raeini goats in Kerman province. Dehaired cashmere is one of the finest and softest luxury natural fibers of the world used mainly for clothing providing warmth and lightness (Watkins and Buxton, 1992). Iranian cashmere is generally designated as 2-3 μm coarser than Chinese and Mongolian cashmere (Petrie, 1995) and is therefore cheaper (Phan and Wortmann, 2000; Schneider, 2011). Ansari-Renani (2001) showed that cashmere produced by three different Iranian breeds, Raeini, Nadoushan and Birjandi, was indeed coarser but also longer than cashmere from China and Mongolia.This paper studiedcashmere quality and its variation in Raeini flocks in the main cashmere producing region in Iran in order to determine the scope for improvement.

Materials and Methods

Twenty nine Raeini nomad flocks were randomly selected within about 20 km of the city of Baft and a stratified fiber sampling was organized. Samples were collected from four randomly selected goats of each sex (females, males) by age (1, 2 and 3 years) combinations; in total 686 samples were obtained; Sampling was conducted in early spring (mid-April 2010), prior to the seasonal moult and regular annual shearing period.

The raw cashmere samples consisting of undercoat and guard hair were sent to the Alrun Fiber Laboratory in Almaty, Kazakhstan for analyses. The dehaired cashmere was minicored into 2 mm snippets, washed in solvent, dried, reconditioned and then tested using an optical fiber diameter analyzer (OFDA 4000 in the mode of an OFDA 100). Based on more than 4300 individual fiber measurements, mean cashmere fiber diameter (MFD, μm), fiber diameter standard deviation (FDSD, μm) and fiber curvature (FC, $^{\circ}$/mm) were measured. Cashmere staple length (SL, mm) was obtained as the mean of three staples. Analysis of variance was performed using a mixed linear model (Mixed Procedure of SAS, 2008).

Results and Discussion

Table 1 shows the overall means, standard deviations and ranges for the six traits considered across all sampled animals. Table 2 presents flock averages for these traits. In this case some of the variation may be due to different management, shearing dates, genetic quality, or other environmental or genetic factors. As expected, across animal and across flock means were almost equal but standard deviations and ranges are smaller for flock averages. The flock averages not necessarily

Table 1. Overall means, standard deviations (s.d.) and ranges of fiber characteristics for Raeini goats

Trait	No of animals	Mean	s.d.	Minimum	Maximum
Fleece weight (g)	643	507.3	182.6	100	1,250
Cashmere yield (%)	686	56.5	12.2	9.5	87.1
Mean fiber diameter (µm)	686	19.7	1.5	14.9	25.2
Fiber diameter standard deviation (µm)	686	4.5	0.6	3	7.4
Fiber curvature (°/mm)	686	62.9	8.5	33.9	93.6
Staple length (mm)	686	54.2	7	40	79

Table 2. Flock average means, standard deviations (s.d.) and ranges of fiber characteristics for Raeini goats

Trait	No of flocks	Mean	s.d.	Minimum	Maximum
Fleece weight (g)	29	505.6	94.3	306.3	678.1
Cashmere yield (%)	29	56.5	4.5	49.9	72.6
Mean fiber diameter (µm)	29	19.7	0.6	18.4	20.5
Fiber diameter standard deviation (µm)	29	4.45	0.19	4.03	4.91
Fiber curvature (°/mm)	29	62.9	3.3	57.8	69.3
Staple length (mm)	29	54.2	1.4	52.2	57.1

represent a typical Raeini flock because of the deliberate stratified sampling in our study.

Males had on average 139.9 g ($P<0.0001$) higher fleece weight than female goats but there was no significant difference in fleece weight between goats at different age. Males had also slightly higher cashmere yields than females (2.6% points, $P<0.003$) and there was a slight reduction of yields with age (58.3, 56.1, and 55.3%, $P<0.019$).

Results indicate that overall cashmere diameter was 19.7±1.5 µm. In a FAO publication Iranian cashmere was described as having a range of diameter of 17-21 µm and that it is chiefly used for weaving (Petrie, 1995).

All samples had a curvature greater than 34 °/mm with 17% between 34 and 60°/mm, 61% between 61 and 75 °/mm and 22% between 76 and 94 °/mm. Compared with cashmere of China, Tajikistan and Kyrgyzstan with mean fibre curvature of 46, 46, and 58 °/mm (McGregor *et al*., 2009); cashmere of Raeini goats would be

considered as highly curved and long which is preferred for woven worsted yarn products.

Significant strong negative relationship (-0.647, P<0.0001) was found between mean fiber diameter and fiber curvature (Figure 1). This negative relationship in cashmere goats of Kyrgyzstan and Australia was 51 and 39% respectively (McGregor and Butler, 2009; McGregor *et al*., 2009). Average cashmere staple fiber length was 54.2 mm (Table 1) with no age or sex effects. The actual distribution of staple length and FD of samples in Figure 2 shows that there is no strong relationship between these two characteristics.

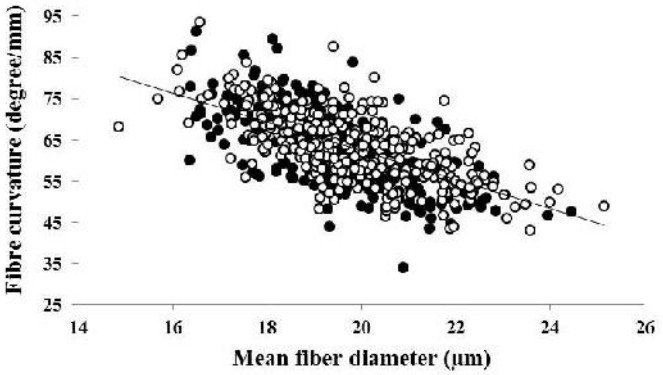

Figure 1. The relationship between mean fibre diameter and fibre curvature from individual goats. Symbols: does (●); bucks (○).

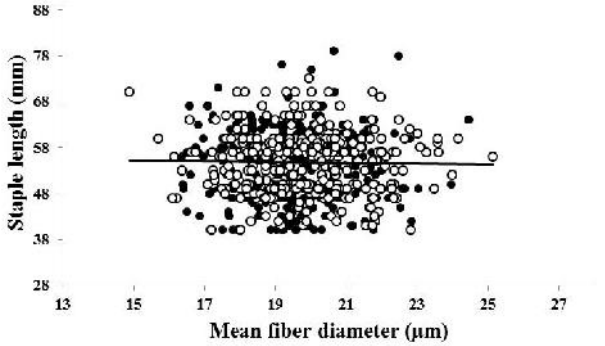

Figure 2. The relationship between mean fibre diameter and staple length from individual goats. Symbols: does (●); bucks (○).

Development options for cashmere production and conclusion

Raeini cashmere can be characterized as long and highly curved however steps must be taken to improve fibre diameter to capture higher prices in the international markets. Significant differences were found between goats and between flocks in-

dicating the potential to improve cashmere quality and the need for adopting proper management and selection methods. This may be achieved through selection of goats with finer cashmere taking care of maintaining the excellent cashmere staple length and curvature. Moreover, sorting the clip in fiber diameter lines would certainly improve cashmere quality; cashmere fleeces from one year old goats and that of fine older goats should be kept separate from the coarser cashmere fleeces after harvesting and before packaging. Furthermore, nomad producers do not comb their goats to harvest shed fibres, instead they shear 1-2 months after onset of shedding. Results from previous studies indicate that 30% of cashmere is lost during shedding season and if not harvested it would be wasted (Ansari-Renani *et al*., 2011). Introducing combing would increase the weight and commercial value of cashmere.

However, at present no price differential is paid to the producers for fine cashmere, as a major portion of cashmere produced is exported without any added value through processing. Cashmere harvesting and buying takes place over a short period of time in spring. The nomad producers and small-scale domestic traders are not aware of world market prices for different cashmere quality classes. As a result of the current marketing system and lacking infrastructure nomad producers do not achieve good prices and have little incentive to produce better quality cashmere.

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