Egyptian Journal of Sheep & Goat Sciences, Proceedings Book of the 5th International Scientific Conference on Small Ruminant Production, Sharm El Sheikh-Egypt, P: 67-72, 2015

SOME PHENOTYPIC CHARACTERISTICS OF WOOL AND HAIR OF BOTH GOAT AND CAMEL

Helal, A; Al-Betar, E.M. and Gad-Allah, A.A.

ABSTRACT

Representative samples of Barki wool hair of both Baladi and Shami goats and Camel-hair were collected during shearing time. Scales of fibers play a vital role in some characteristics like fineness, softness, smoothness, light reflection and abrasion. In the present study scales edges found to be smooth or rippled in wool, rippled or smooth in camel hair, while it was smooth in goat's hair of both Baladi and Shami. Distances between scales were near to distance in all studied fibers types. Scales appearance was mosaic in wool, Chevron in camel-hair and wave in goat hair. The variation among studied fibers types in medulla type and medullary index were also discussed.

***Keywords*:** Camel hair fibers, Baladi Goats, Shami Goats, Scales, Medulla, Medullary index**.**

INTRODUCTION

Scales is a simple feature used to identify animals as it involves in many natural and industrial characters like smoothness, lusters, felting and friction (Houck, 2009). Medulla also differed among animals where it helps in reflecting direct sunlight while considered as a problem (according to its type and volume) during spinning and dyeing processes. The aim of this study was to spotlight on the variations among hair of Balady and Shami goats as well as camel hair in both scales and medulla types.

MATERIALS AND METHODS

A representative amount of Barki wool, Shami goat's hair, Balady goat's hair and camel-hair fibers (Magrabi camels) were collected during shearing season. Fiber diameter (FD) was measured for samples using image analyzer (LEICA Q 500 MC) with lens 4/0.12. A section of 0.2 mm in length was cut by a Hand-Microtome at a level of 2 cm from the base of the lock of each sample. These cutts were put on a microscope slide with 2-3 drops of paraffin oil and covered with a slide cover. About five hundred fibers were measured for each sample. Medullated fibers percentage (M %) was recorded as a percentage of medullated fibers of the corresponding total fibers used during measuring FD. Medullary Index was measured as diameter of medulla / fiber diameter and calculated as percentage. Fiber scales characteristics measured using scan electron microscope (SEM).

RESULTS AND DISCUSSION

Scales of fibers play a vital role in reflecting sun light and type of luster as well as in some industrial characteristics like friction, smoothness and felting. Morton, et al. (1962) stated that scales face towards the tip of the fibers, and cause a directional effect, which is important in the frictional behavior. In table (1) scales of fine wool had higher dimension in length, width and both thickness and height at the edge compared with coarse wool. This could be reasonable because in fine wool fibers scales are coronal in type which one scale goes around the hair shaft and completely encircling it, while scales of coarse wool fibers has imbricate type, which needs more than one scale to surround the fiber shaft. Kassenbeck (1961) illustrated the various types of scale pattern found in different types of wool and other fibers. Figure (1) shows different types of scales of different fine fibers of studied animals and Figure (2) shows different types of scales characteristics among coarse fibers of studied animals. Scale edge found to be smooth or rippled in wool, rippled or smooth in camel hair, while it was smooth in goat's hair of both Baladi and Shami. Distances between scales are near to distance in all studied fibers types. Scales appearance was mosaic in wool, Chevron in camel-hair and wave in goat's hair. Scale of Shami

Table (1). Fiber diameter and scale dimensions among different fiber types.

Fiber type (µ)	Fiber diameter	Scale area	Scale long	Scale width	Scale thickness	Scale height
Fine wool	27.00	96.87	22.82	23.67	0.46	0.18
Coarse wool	63.31	99.25	17.21	15.96	0.40	0.15
Shami outer coat fiber	54.97	73.30	12.79	24.79	0.47	0.42
Balady outer coat fiber	50.59	75.61	12.95	22.85	0.29	0.20
Fine camel-hair	22.89	61.72	11.73	18.84	0.28	0.20
Coarse camel-hair	44.92	56.21	8.13	12.52	0.25	0.12

Table (2). Average fiber diameter, medullated fiber percentage and medullary index among studied fiber types.

Type	Fiber diameter µ	Medullated fiber %	Medullary index %
Coarse wool	55.57	44.05	42.83
Shami outer coat fiber	66.01	50.47	41.36
Balady outer coat fiber	100.59	98.74	58.86
Coarse camel fiber	52.28	56.82	78.66

Table (3). Percentage of medulla types exist in studied coarse fibers types.

Medulla type	Wool	Camel hair	Goat hair
Fragmental	7%	38%	2%
Interrupted	12%	12%	5%
Continues	81%	50%	93%

outer coat fibers had the highest thickness and height compared with other fibers, which could help in protecting animals from direct sunlight (Table 1). Fiber diameter in table (1) didn't represent the average fiber diameter of each type but it only express the diameter of selected fibers used with Scan Electron Microscope. Camel hair fiber had the lowest scale area, length and thickness, which could reflect the specialty of camel hair fiber as smooth and soft fibers. Anjali and Suman, (2013) classed camel hair as a hair fiber. Results in table (2) showed that the percentages of fibers contain medulla is higher in Balady outer hair (98.7%) followed by outer camel-hair (56.8%), Shami outer hair (50.5%), and coarse wool fibers (44.1%). While percentage of medullated fibers in camel outer hair was lower compared to Balady goat's fiber. Camel hair had the highest value of medullary index percentage among all studied types. In table (3) continues medulla found in 81% of coarse wool fibers, while fragmented medulla represents only 7% and interrupted medulla was 12%. Coarse camel hair had the highest percentage of fragmented medulla (38%) compared with other studied fibers types, while it had the lowest percentage of contentious medulla (50%) among other fibers types. Almost contentious medulla is the common type in goat's hair (93%). As shown in figures (3, 4, 5 and 6) medulla types and volumes differ with fibers had similar diameter within each type of studied fibers. In the first Image to the left of figure (3) medulla volume is so small compared with the other two fibers in the middle with contentious

medulla. The same variation also found among Shami goat's hair, which had almost the same diameter but with different medulla type fibers (Figure 4, the two fibers in the top to the left). Both coarse fibers of Balady goats and Camel had the same trend (Figures 5 and 6). Variation of fiber diameter is not preferred because of its importance in the textile processes and product quality as mentioned by Hunter, (1980) and Von Bergen, (1963). The kemp fibers (Figure 3 to the right) had a special type of medulla which is latticed and considered as a fingerprint of kemp fibers (Ryder and Stephenson, 1968). Medullary index is expressed as a ratio of the diameter of the medulla to the shaft diameter that always used to distinguish animal fibers from other fibers. In animals, the medulla make up more than 1/2 of the total diameter of the fiber (Saferstein, 2004). Moreover, Kshirsagar, et al. (2009) found that Medullary Index of animal hair was 0.44. In the present study medullary index found to be 78.7 in coarse camel-hair followed by Balady goat outer coat (58.9), while both Shami outer coat and coarse wool fibers had almost the same number (41.4 and 42.8, respectively). These findings are corroborated with Krishnan (2008) who stated that, the medullary index of animal hair is more than 0.50. Medullary index within 5 µ started from 30 to 35 µ expressed in table (4) which show the variation within each fiber type and between types in the same range of fiber diameters. Hair medulla index of goat hair was higher than the other types of fibers till range 81-85 µ. Kemp fibers, which usually had higher medulla than 70 µ, had the highest medullary index among other types. Camel outer hair take the same trend of coarse wool in medullary index especially with absent of fiber diameter from 91 µ to 135 µ which indicated that Egyptian coarse camel hair could blend with wool for textile purposes. Wool is the nearest type had regular trend among other fiber types, where medullary index increased with increasing fibers diameter.

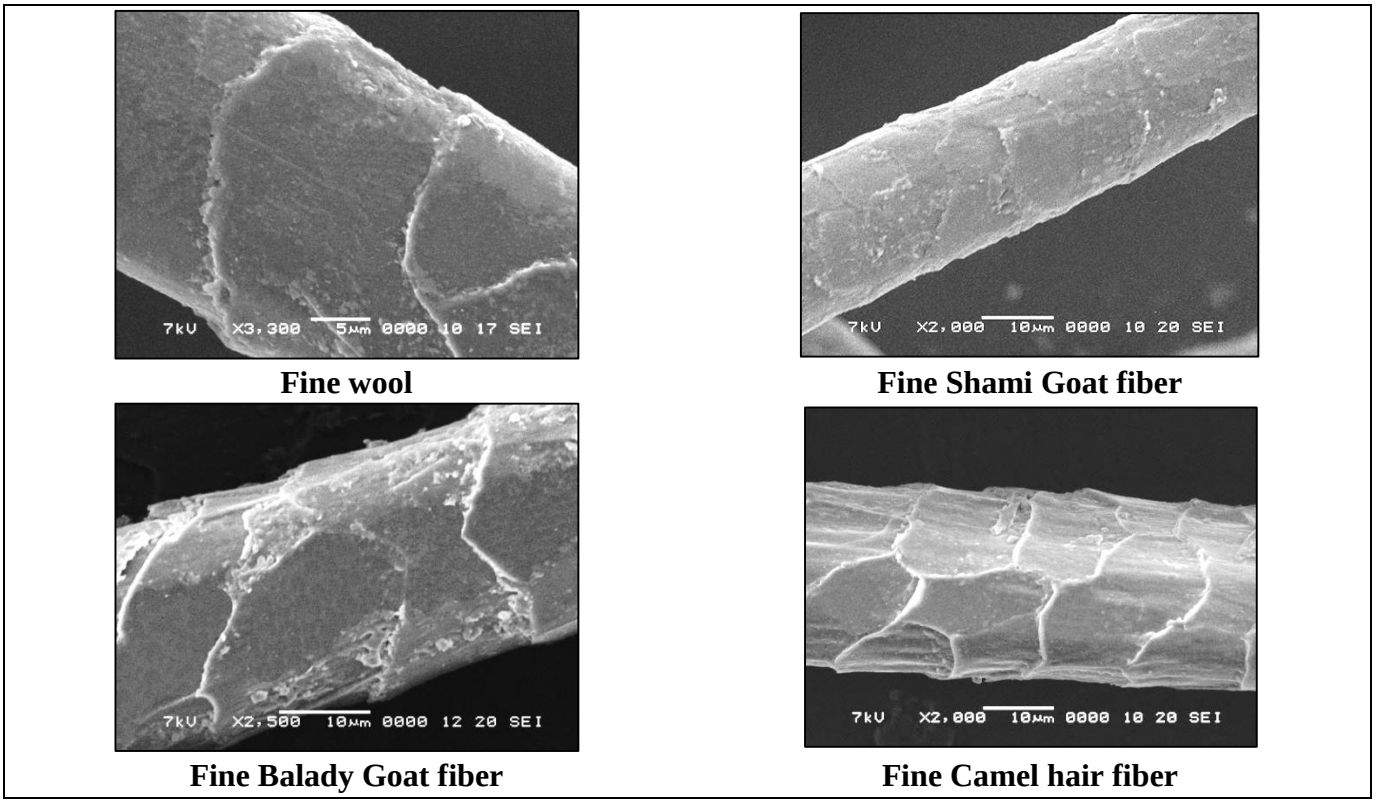
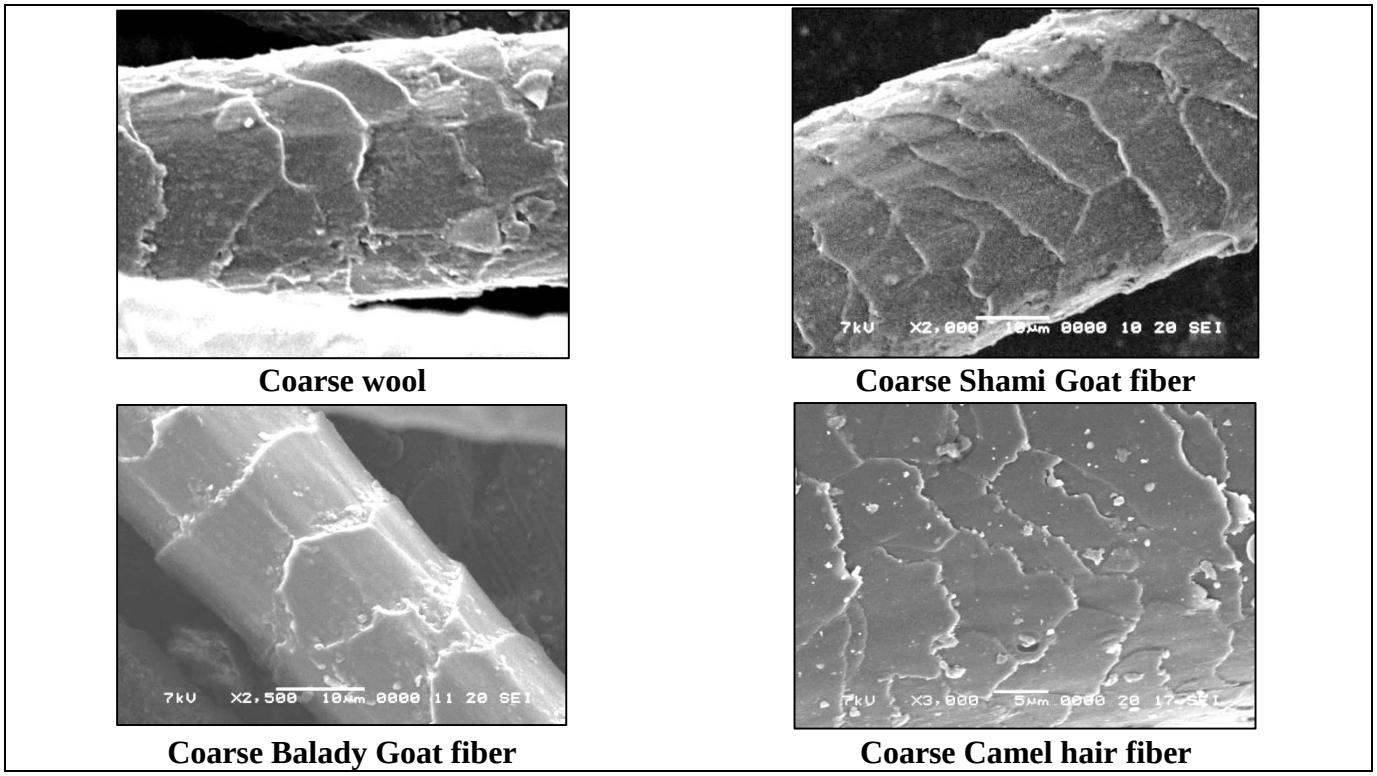


Fig. 1: Scales types among different fine fiber types

Table (4). Average Medullary index of wool, camel and Balady goats

Range of FD	Wool Med%	Camel hair Med%	Goat Hair Med%
30-35	28	44	82
36-40	30	40	59
41-45	27	41	76
46-50	28	38	56
51-55	28	36	52
56-60	31	37	53
61-65	33	47	53
66-70	34	46	52
70-75	31	33	54
76-80	60	35	60
81-85	25	38	57
86-90	76	64	57
91-95	0	0	61
96-100	0	0	67
101--105	0	0	64
106-110	0	0	66
111-115	0	0	72
116-120	0	0	74
121-125	0	0	74
126-130	0	0	82
131-135	0	0	80
136-140	83	0	72
141-145	87	53	72
146-150	89	40	87
151-155	91	43	82
156-160	90	0	80



Coarse wool **Coarse Shami Goat fiber**

Coarse Balady Goat fiber **Coarse Camel hair fiber**

Fig. 2: Scales types among different coarse fiber types

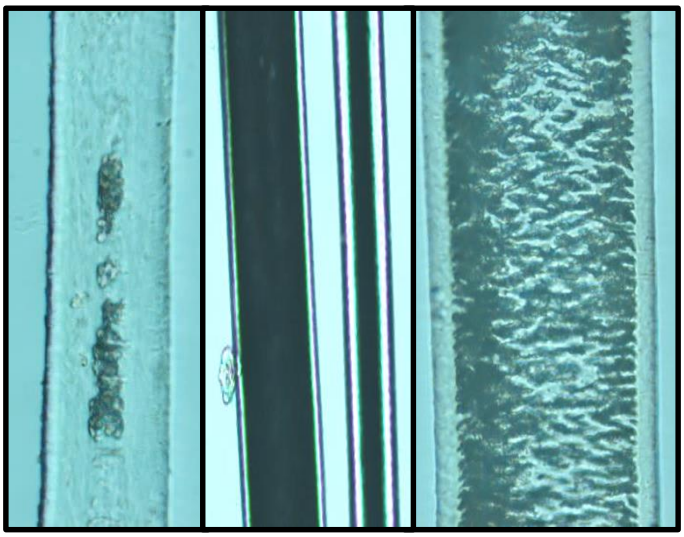


Fig. 3: Different types of wool fibers medullas

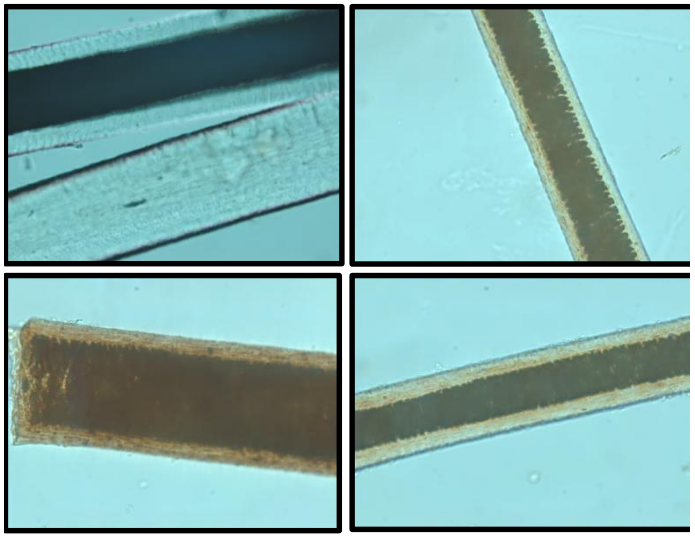


Fig. 4: Different types of Shami fibers medullas

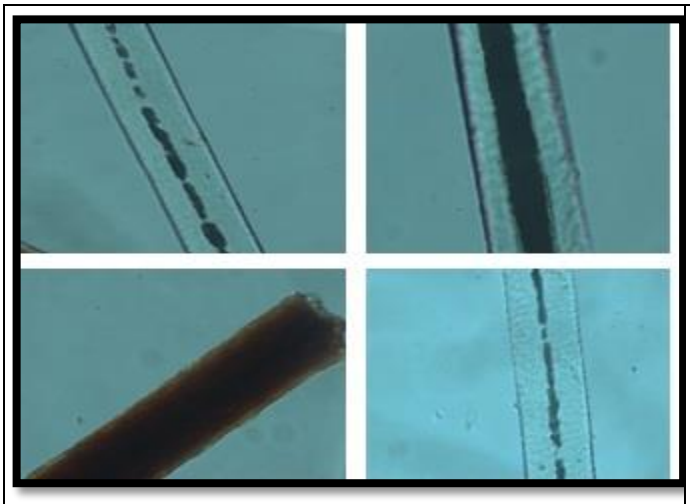


Fig. 5: Different types of Balady fibers medullas

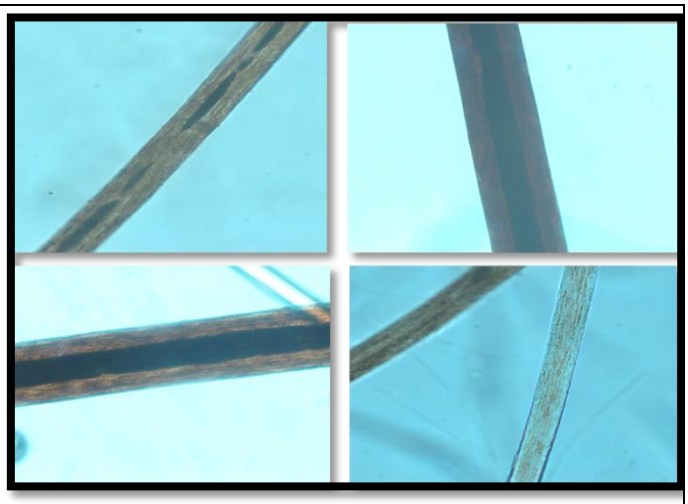


Fig. 6: Different types of Camel fibers medullas

CONCLUSION

Fibers coming from Barki sheep, Shami and Balady goats as well as Camel hair had great variation among their diameters, medulla types and medullary index . Camel coat has a special character and could be blend (the outer coat or coarse fibers) with wool for textile purposes.

REFERENCES

Adrian, L. (2009). Forensic Science in Wildlife Investigations, CRC Press.

Anjali, S. and Suman, P. (2013). Studies on camel hair-Merino wool blended knitted fabrics, Indian Journal of Fabric and Textile Research, 38:317-319.

Houck, M. M. (2009). Identification of Textile Fibers, Wood head publishing limited and CRC press LLC.

Hunter, L. (1980). The effect of wool fiber properties on processing performance and yarn and fabric properties. Proceedings of the 6th International Wool Textiles Research Conference, 1: 133 - 193.

Kassenbeck, P. (1961). Le polymorphism des fibers keratiniques. In "Structure de la laine", pp. 51-74. Institute Textile de France, Paris.

Krishnan Vij, (2008). Textbook of Forensic Medicine and Toxicology, 4th Edition, 64-67.

Kshirsagar S.V, Singh B., Fulari S. P. (2009). Comparative Study of Human and Animal Hair in Relation with Diameter and Medullary Index. Indian Journal of Forensic Medicine and Pathology. 2(3), 107.

Morton, W. E. and J. W. S. (1962). Hearle, Physical Properties of Textile Fibres, Butterworth and Co. Ltd. and The Textile Institute, Manchester & London, 54-55.

Ryder, M. L. and Stephenson, S. K. (1968). Wool growth. Academic press, London and New York.

Saferstein, Richard. Criminalistics, (2004). An Introduction to Forensic Science. (8th ed.) Pearson Education Inc., Upper Saddle River, New Jersey.

Von Bergen, W. (1963). In Wool Handbook, 1st Ed. Von Bergen. (London; Inter science Publishers).