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Anatomical Studies on Hair Shaft of Blackbuck

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ABSTRACT

Hair is a flexible and keratinized structure produced from hair follicle. Microscopic structure of black buck hair comprised of cuticle, cortex and medulla from without inwards. Color variation was observed within an individual and also within an individual hair. Imbricate pattern of cuticle was observed in the midshaft and base but it was coronal in the tip of the hair. Cortical fusi were present in the hair shaft of back region. Ovoid bodies were observed towards the base of the shaft of back, hind limb region hair. Cortex pattern was smooth but coarse in few hair samples. Medulla was non lattice type with scalloped or irregular margins. . Medulla was absent in the tip and was tapered towards tip of the shaft with Scalloped, irregular and straight medullary margins. Medulla was Wine glass shaped, tapered medulla, fragmentary or widened towards base of the shaft. Pigment distribution was uniform and banded. Variation in pigment distribution was evident within individual hair. Imbricate scale pattern with overlapped scales were present in the mid shaft and coronal type in the tip of the shaft. Trough on surface of hair was an important feature of blackbuck hair. In general scale width was more in the base of the shaft

Key words: *Blackbuck, Hair, medulla, Scale pattern, Cast method.*

INTRODUCTION

Hair is strongly resistant to decomposition[5] and is stable under adverse conditions[4]. Identification of hair has been used in forensic medicine, taxonomy, palaeontology, zooarchaeology, anthropology and ecology[7]. Black buck is considered as endangered species and is listed under Indian Wild life Act 1972. Information pertaining to study of black buck hair is very scant in India when compared to that of abroad. Therefore, investigation of hair of blackbuck was taken up in the present work.

MATERIAL AND METHODS

The present study was conducted on guard hair of six Blackbucks (*Antelope cervicapra*) from Nehru Zoological Park, Hyderabad. Hair samples from six different regions *viz.*, neck, back, abdomen, fore limb, hind limb and tail were collected from individual animal by plucking.

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The Whole mount method[3] was used for processing for microscopic physical examination of hair. DPX was used instead of synthetic resin for mounting which was a slight modification to the method. Individual scale pattern was studied by simple cast techniques in which a mixture of uncolored nail varnish and amyl acetate was used.

RESULTS AND DISCUSSION

MICROSCOPIC OBSERVATIONS

The present findings of hairs of Black buck revealed two distinct parts, a hair bulb and a hair shaft. The cuticle of hairs was thin translucent layer on the exterior surface of the shaft with flattened cells. Cortex is clear which formed the main body of the shaft[5]. Medulla was seen as a cellular, central core that ran through the centre of the cortex.

COLOR AND TIP

Color of hair varied from colorless to brown *i.e.*, light brown, honey brown and brown. In general decreased color intensity was noticed towards the basal portions of hairs of most of the regions studied. The variation in color could be substantiated as referred by Elly *et al*., The tip of hair was frayed in neck (Fig.1.a), pointed in the back, abdomen, forelimb and tail region (Fig.1b) whereas rounded in hind limb hairs (Fig.1c).

CUTICLE PATTERN

The cuticle pattern was smooth (fig.2a) in hair of all regions studied except in the mid shaft of forelimb where it is serrated (fig.2b). Cuticle was colorless in most of the hairs but light brown colored cuticle was present in the hair of back region (fig. 2b).

CORTEX

Cortex pattern was coarse in tip of neck hair, tip and mid shaft of abdomen region hair whereas smooth in the hair of other regions studied. The cortical fusi were found in the root end of the hair of neck and back in addition ovoid bodies were present in the base of back region hair (fig.4a) which is in accordance with the findings of Rowe[9].

MEDULLA

Medulla was multicellular, continuous, aeriform and non-lattice type in hair of all regions except in base of tail hair where it was cellular or vacuolated (fig.4b). Medulla was absent in the tip portion of hair whereas fragmentary (fig.2a) or tapered (fig.2b). Medulla appeared like wine glass (fig.2d) towards the base in the hair of neck whereas widened in lateral abdomen hair (2c). Regional wise variation of medulla in hair shaft was observed. Air filled medulla appeared dark while fluid filled medulla was like bubbles[9]. Medullary edges were scalloped, irregular (fig. 3b) or straight (fig.3c).

PIGMENT DISTRIBUTION

Pigment distribution revealed that pigment almost uniform between the cuticle and medulla which was in contrary to the findings of Deeedrick and Koch[2]. Banding of pigment was observed in the midshaft of back, hindlimb and in addition base of lateral abdomen region hair (fig.3c). Decreasing pigment intensity was noticed towards base of the shaft and the pigment granules were brown colored.

SCALE PATTERN BY CAST METHOD

Scale cast pattern was imbricate (fig.2b and c) in the mid shaft and base while coronal (fig.2a) towards the tip of the hair shaft[6]. Trough formation was evident in mid shaft of the hair (fig.5b).

MICROMETRY

There were significant differences in mean cortical thickness, medullary diameter, shaft diameter and medullary index in hairs obtained from different regions of the body and also within a single hair. Analysis of variance of cortical thickness, medullary diameter, shaft diameter and medullary index were listed in the Table. The difference of mean cortical thickness of lateral abdomen (10.18 ± 0.26 µm) and tail hair (12.58 ± 0.26 µm) was highly significant. Significant difference of medullary and shaft diameter was found between the hair of most of the regions but difference was not significant between the hairs of neck and back and also hair of forelimb, hind limb and tail not differed significantly. Medullary index of hairs of all regions differed significantly, however hair of neck and back (0.73 ± 0.01 µm) regions exhibited high significant

difference with that of forelimb region (0.80 ± 0.01 µm) (Table 12). But difference of mean medullary index between neck and back and between forelimb and hind limb was not significant.

CONCLUSION

The hair shaft of Blackbuck was with medulla, cortex and cuticle from within outwards. Cuticle pattern was imbricate throughout the length except at tip where it is coronal pattern. Cortex forms the body of shaft with pigment in it. Medulla was non- lattice type. Important anatomical feature of blackbuck hair is presence of trough which give bean shaped cross sections.

Table 1. Analysis of Variance for Cortex, Medulla, shaft diameter and Medullary Index of hair shaft of Blackbuck

Effect			Cortex		Medulla diameter		Shaft diameter		Medullary index	
Source	Dependent Variable	df	Mean Square (µm)	F	Mean Square (µm)	F	Mean Square (µm)	F	Mean Square	F
Region		5.00	127.91	12.42**	16775.38	21.32**	18861.98	22.50**	0.13	17.47**
Location		2.00	57.51	5.59**	17019.89	21.64**	15667.32	18.69**	0.13	18.00**
Region ×location		10.00	66.27	6.44**	7099.87	9.03**	7534.57	8.99**	0.04	5.83**
Error		882.00	10.29		786.67		838.27		0.01	

**Significant (P≤ 0.01)

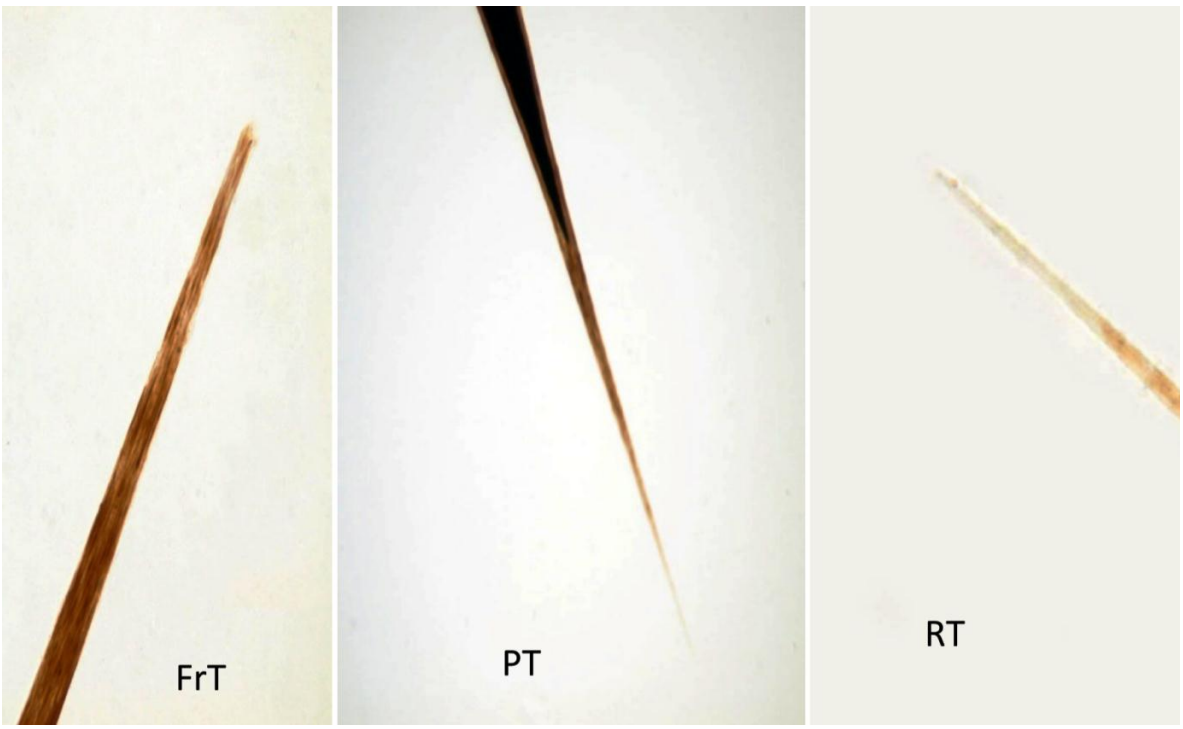

Fig. 1 **a**) Frayed tip **b)** Pointed tip **c**) Rounded tip

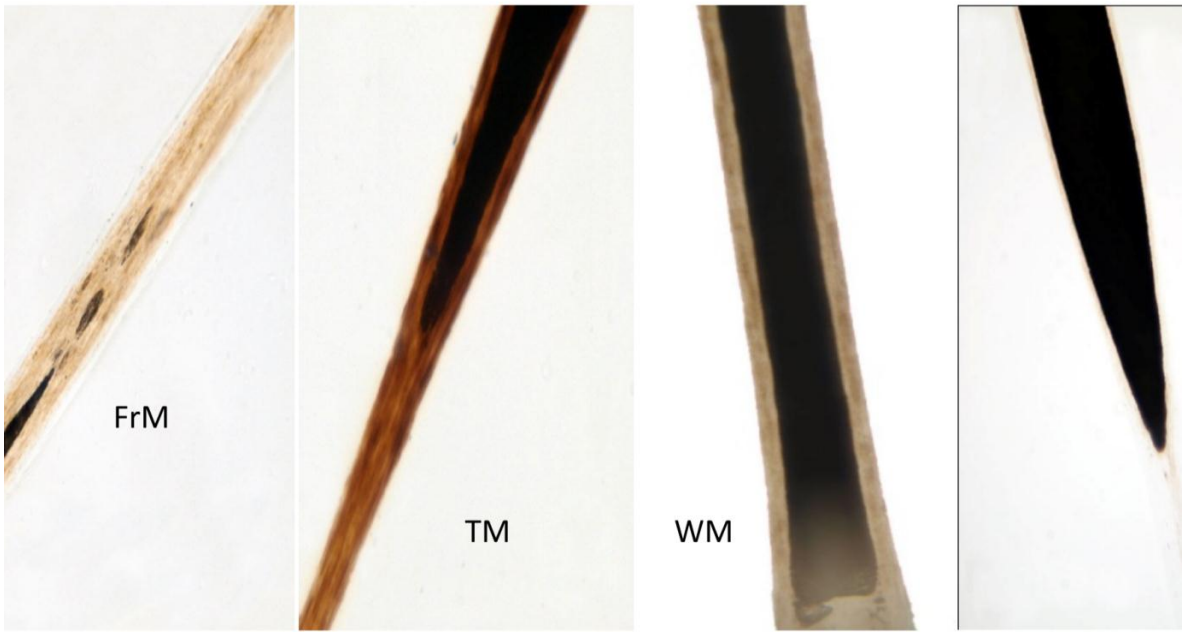

Fig. 2 **a.** Fragmented medulla (FrM) towards tip **b**. Tapered medulla(TM) towards tip **c.** Wide medulla (WM)towards base **d**. Wine glass shaped medulla

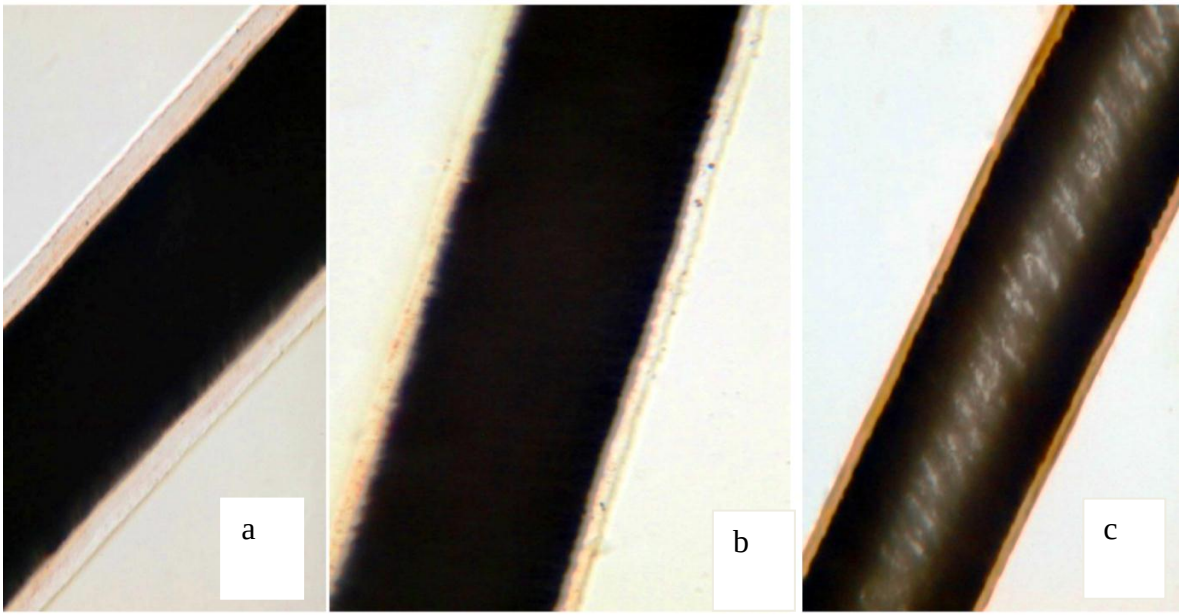

Fig. 3 **a**. Translucent cuticle with smooth surface **b**. Irregular medullary margIns **c** Banding of pigment

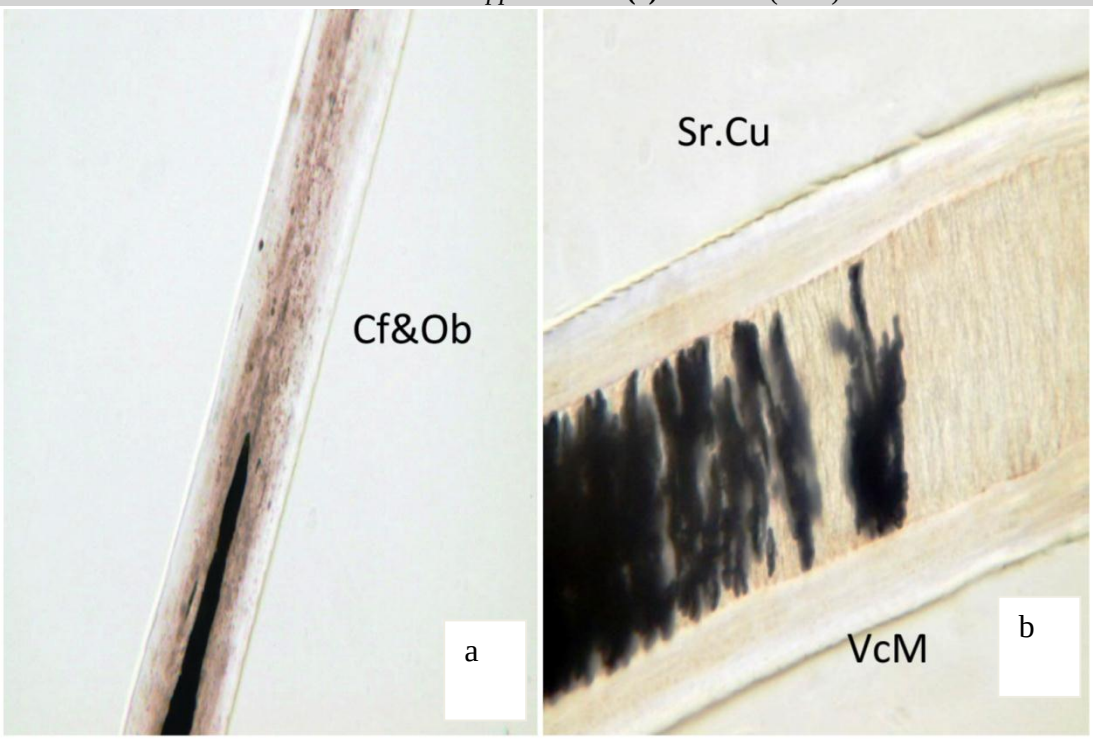

Fig. 4 **a** Cortal fusi(Cf) and Ovoid bodies (Ob) **b**. Vacuolated medulla(VcM) and serrated cuticle(Sr.Cu)

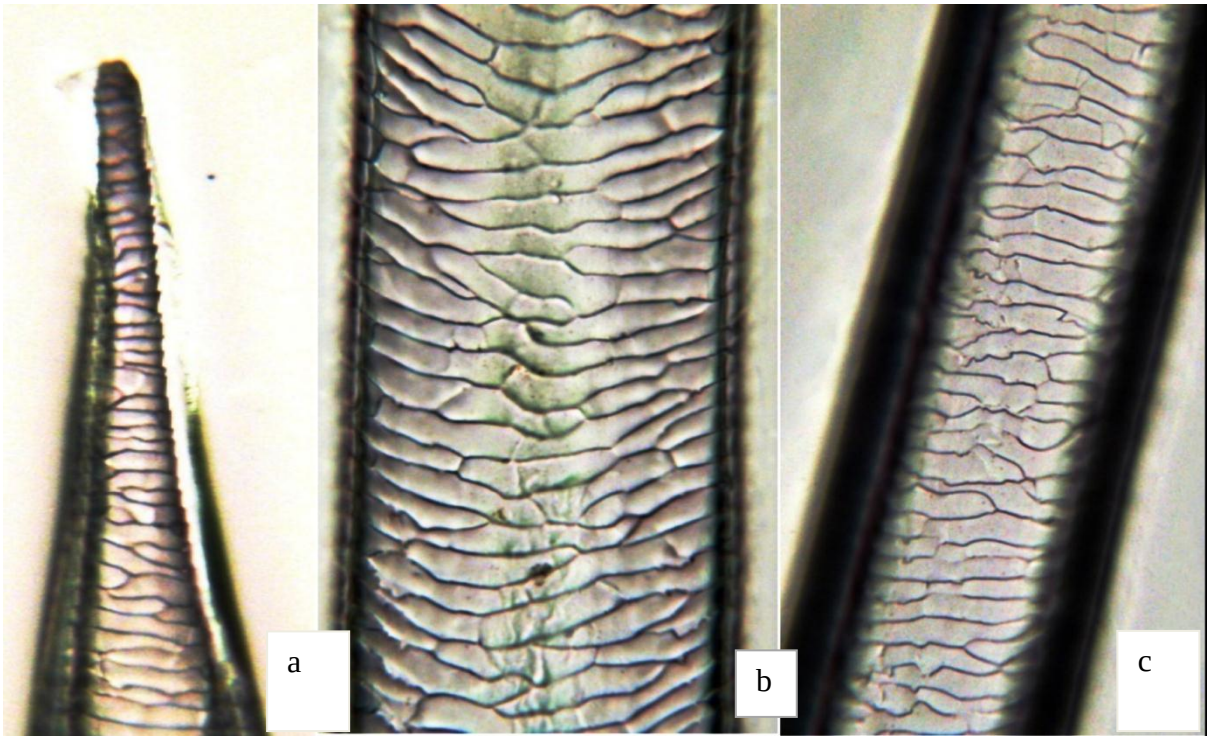

Fig.5 **a.** Coronal scale pattern in the tip **b**. Imbrcatesclae pattern with trough in the midshaft **c.** Imbricate scale pattern towards the base

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