RESEARCH ARTICLE

Cuticular and Medullary Structure of Some Wild Herbivores of India

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ABSTRACT

The dorsal guard hair is considered as a mammalian exoskeleton. The anatomical feature of the three concentric layers of the mammalian hair, viz., medulla, cortex, and cuticle vary considerably with different species. The characteristics features of cuticular scales and medullary pattern can be used as an important tool for species identification by using various methods for hair analysis. The morphological features of cuticle and medulla of dorsal guard hair samples of Sambar (*Rusa unicolor*), *Nilgai*/blue bull (*Boselaphus tragocamelus*) and Spotted deer (*Axix axis*), six each, were studied during post-mortem examination. The microscopic studies showed a difference in some of the cuticular scale and medullar cells among three species. Hence, a single morphological feature of hair may not be a confirmative tool for species identification but multiple morphological features can be used as a confirmative tool of species identification. This study provides pictographic details in eead of some wild species which can be used to curb criminal acts against wild animals.

Keywords: Cuticle, Guard hair, Medulla, *Nilgai*, Sambar, Spotted deer.

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INTRODUCTION

Identification of animal species on the basis of biological exhibits is the most important part of the wildlife forensics. The morphology of biological exhibits may not give results due to the small size of samples like part of the skin or bone. In such cases, the tricho-taxonomy is used for the identification of species on the basis of combination characters of guard hair of mammals. The selection of proper approach for analysis is required for the identification from small samples. The species can be identified with the help of dorsal guard hair from its cuticular and medullary characteristics by using noninvasive methods. Many workers (Brunner and Coman, 1974; Koppiker and Sabnis, 1973; Teerink, 1991) have well documented the different characters of the cuticular scale pattern of wild and domestic mammalian hair. However, scanty information is available on comparison of cuticular and medullary characters of Indian wild mammals like Sambar (*Rusa unicolor*), *Nilgai*/ blue bull (*Boselaphus tragocamelus*) and Spotted deer (*Axix axis*). So, the aim of the present work was to provide details of cuticular and medullary characters of dorsal guard hair with the support of microphotographs for the differentiation of these three species, *i.e.*, Sambar, *Nilgai*, and Spotted deer.

MATERIALS AND METHODS

The tuft of 15–20 guard hair was collected from the mid-dorsal region of the animal body. The samples were taken from six dead bodies of each species, which were brought to the Department of Veterinary Pathology, Nagpur Veterinary College, Nagpur for postmortem examination.

The hair was washed with soap water and rinsed in distilled water. After washing, the negative cast was prepared

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as per the method given by Lungu *et al.* (2007). A thin film of transparent nail paint and amyl acetate was prepared on a glass slide with the help of brush provided with nail polish. The hair with one end free was kept on the semi-dried nail paint film. The slides were air dried in a closed container for 20–30 minutes and then the hair was removed with the help of tweezers. The slides thus prepared were observed under a binocular microscope at magnification 400× and were photographed and observed for different cuticular scale pattern.

The medullary characters were studied by using the whole mount of hair, which was prepared as per the method given by Kshirsagar *et al.* (2009). The hair was washed with the soap solution and rinsed in distilled water for 2–3 times. The hair was transferred to the solution containing petroleum ether and absolute alcohol in equal proportion (1:1) for 2–3 minutes. The hair was then transferred to the hydrogen peroxide for 2 hours. The hair was dried and transferred to the clearing agent, the xylene for 48 hours. The hair was

mounted on a glass slide with natural Canada Balsam. The whole mount slides were photographed and observed under a microscope at 50×, 100×, 200×, 400× and 1000×.

Results and discussion

The observations in respect of various characters, related to the medulla and cuticle of hair of different species of animals under study are shown in following Table 1, and Figure 1 to 3.

The cuticular characters like scale position, scale pattern and scale margin distance were similar in Sambar and Spotted deer, but were different in *Nilgai*. Transversal scale position, regular wave scale pattern with near scale margin distance was observed in both the species, *i.e.,* Sambar and Spotted deer (Figs 2b and 3b), whereas intermediate scale position, irregular wave pattern with the close distance between margins were noted in *Nilgai* (Fig. 1b). Dharaiya and Soni (2012) noted similar cuticular scale pattern in Sambar, *Nilgai* and Spotted deer. Bhat *et al.* (2014) also observed irregular wave cuticular scale pattern in *Nilgai* with close distance between scale margins. The structure of scale margin was

Table 1: Microscopic characteristics of hair of Sambar, *Nilgai* and Spotted deer

Microscopic hair characteristics	Sambar (Rusa unicolor)	Nilgai (Boselaphus tragocamelus)	Spotted deer (Axis axis)
Cuticular scale position	Transversal	Intermediate	Transversal
Cuticular scale pattern	Regular wave	Irregular wave	Regular wave
Structure of scale margin	Rippled	Crenate	Smooth
Distance between scale margin	Near	Close	Near
Composition of medulla	Multicellular in row	Multicellular in row	Multicellular
Margins of medulla	Scalloped	Scalloped	Scalloped
Medulla structure	Wide medulla lattice	Cloisonne	Crescent
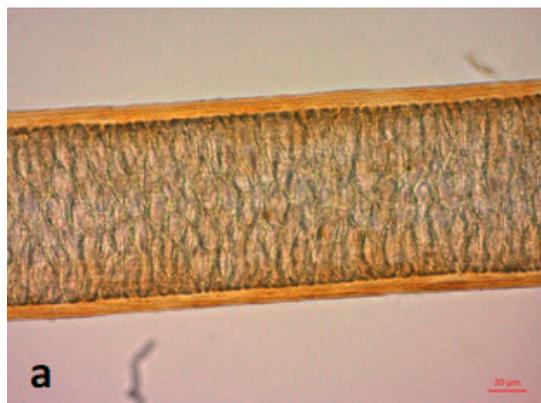
Medulla 400×
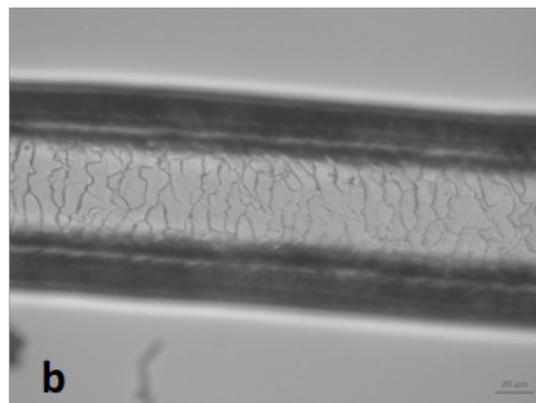
Cuticula 400×

Figs 1a and b: Photomicrograph dorsal guard hair of *Nilgai (Boselaphus tragocamelus)*

Medulla 200×
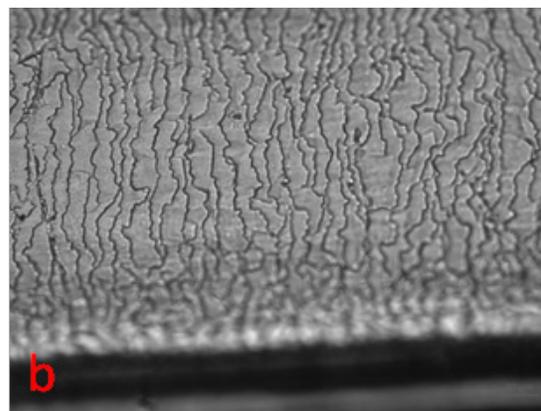
Cuticula 400×

Figs 2a and b: Photomicrograph dorsal guard hair of *Sambar (Rusa unicolor)*

Medulla 400×
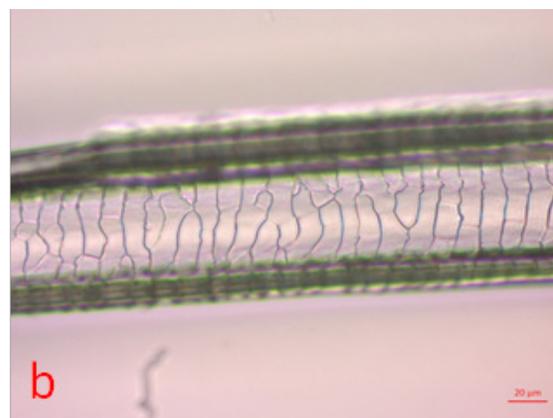
Cuticula 400×

Figs 3a and b: Photomicrograph dorsal guard hair of Spotted deer *(Axis axis)*

found different in all the three species under study. The scale margin was rippled in Sambar, crenate in *Nilgai* and smooth in Spotted deer. Similar cuticular scale margin was observed by Dharaiya and Soni (2012).

During the present study, the similar medullary composition was observed in Sambar and *Nilgai* as multicellular in a row while the multicellular composition (Figs 1a and 2a) was observed in Spotted deer. The scalloped medullar margin was observed in all the three species (Fig. 3a). The medulla structure was found different in Sambar, *Nilgai* and Spotted deer as wide medulla lattice, cloisonné, and crescent, respectively. Wide lattice medulla pattern was also reported by Joshi *et al*. (2012) in Sambar.

Conclusion

The cuticular and medullar characteristics showed striking differences among the dorsal guard hair of Sambar, *Nilgai* and Spotted deer. Therefore, it can be concluded that the identification of animal species by using a single morphological characteristic feature may not be sufficiently reliable. Hence, multiple morphological characteristics features of dorsal guard hair are required for full proof identification of wild animal species from available hair samples.

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