

HAIR CHARACTERISTICS OF INDIAN MOUSE DEER *MOSCHIOLA INDICA* GRAY, 1852

Manokaran Kamalakannan

Zoological Survey of India, M-Block, New Alipore, Kolkata-700053, India

E-mail: kamalakannanm1@gmail.com

Abstract: The dorsal guard hairs of the Indian mouse deer *Moschiola indica* were examined using the light and scanning electron microscopes. Based on a combination characters of dorsal guard hairs, the mouse deer can be identified. The micro-photographs and characters of dorsal guard hairs are presented here can be used in forensic science as well as prey-predator food analysis as an appropriate reference for the species identification.

Keywords: tricho-taxonomy, dorsal guard hair, mouse deer, morphological and microscopic characters.

Introduction

Detailed knowledge on the hair structure is required to identify the species, where the morpho-taxonomy cannot give the proper result. The tricho-taxonomy chiefly used for identification of species on the basis of combination characters of hairs of species, when the morpho-taxonomy is unable to provide a fruitful result in case of small part of skin of mammal. There are many workers *viz.*, Mayer (1952); Stains (1958); Brunner and Comman (1974); Moore *et al.* (1974); Koppiker and Sabins (1975); Teerink (1991); Wallis (1993); Chakraborty and De (2010) have well documented the different hair characters of mammals. In India, the tricho-taxonomic studies have been carried out by many workers on different orders of class Mammalia *viz.*, Rajaram and Manon (1985); De (1993); Chakraborty and De (2010); Bahuguna *et al.* (2010); Sarkar (2011), etc. However, scanty information is available on the hair structure of *Moschiola indica* except a study of Kamalakannan *et al.* (2013). Therefore, the present study was undertaken to provide a complete combination of characters *i.e.* macro and microscopic characters of hairs of *Moschiola indica* for species identification. This species is listed under Schedule I of the Indian Wildlife (Protection) Act, 1972 and as per the IUCN Red List category (2016-3), *Moschiola indica* is Least Concern. The present study was carried out to provide a complete combination of characters such as morphological, cuticular, medullary and cross-sectional characteristics of hair with high resolution micro-

*Received Feb 27, 2017 * Published Apr 2, 2017 * www.ijset.net*

photographs and detailed descriptions using optical and scanning electron microscopes for identification of the species.

Material and methods

The guard hairs were collected from the mid-dorsal region of three dry skin of the species present in the National Zoological Collections, Mammal and Osteology Section, Zoological Survey of India, Kolkata, India. The samples were washed thoroughly with Acetone ($(\text{CH}_3)_2\text{CO} = 58.08$) and Carbon tetrachloride ($\text{CCl}_4 = 153.82$) to remove the dirt of exogenous materials. The morphological characters of hairs ($n = 20$) such as shape, colour, bands were recorded, and total lengths (mm) and diameters (μm) were measured using Dial calliper (Mitutoyo) and optical microscope (Olympus BX41), respectively. The cuticular characters of hair such as scale position, scale patterns, structure of scale margins and distance between scale margins and medullary characters such as width composition, structure and form of margins of the medulla, and shape of cross-section of hair were examined under 400 X magnification with help of the digital camera fitted on optical microscope (Olympus BX41) and the observed microscopic characters of hair were photographed. To obtain the three dimensional structure and a more detailed examination of cuticular scales of hair, the scanning electron microscope (ZEISS Evo18 - Special edition) was used. The cuticular structures of hairs were observed under the high magnifications 1630 and 2600 X, and the observed cuticular structures of hairs were photographed.

All the measurements of cuticular scales were through the optical microscope and the mean values were taken into the consideration for analysis. The methodology and nomenclature of morphological, cuticular, medullary and cross sectional characteristics of dorsal guard hairs were followed according to the descriptions provided by Brunner and Comman (1974), Moore *et al.* (1974), Teerink (1991). The description of different terms of patterns used in the results and discussion have been given herewith were followed from the Brunner and Comman (1974), Teerink (1991).

Results and discussion

The dorsal guard hair of *Moschiola indica* studied is bicoloured having gray at base vanilla colour at tip of the hair, having 2 bands and the profile of hair is straight. The coat colour of animal is spectacled olive brown with clear white stripes and spots. The mean length and diameter of hair was recorded as 21.5–14.4 (19.2 ± 2.2) mm and 66.4–69.7 (68.1 ± 1.3) μm , respectively (Table 1). The cuticular characteristics were as: scale position- ‘transversal’, scale patterns- ‘regular wave’, structure of scale margins- ‘smooth’ and distance between

scale margins- 'near' (Fig. 1; 2). The medullary characteristics were as: composition of medulla- 'multicellular in rows', structure of medulla- 'wide medulla lattice', and form of the medulla margins- 'straight'(Fig. 3). The cross-section was observed as 'oblong' shape (Fig. 4).

The hair of *Moschiola indica* can easily be distinguished from all other Artiodactyls by its colour and profile, which is always straight, bicoloured having colour of gray and vanilla and have distinct microscopic characters such as regular wave pattern and near margin of cuticular scales, multicellular regular and straight medulla, and the shape of cross-section is oblong. So far, there is no specific hair studies have been conducted on this species except the light microscopic study by Kamalakannan *et al.* (2013). Therefore, this study provides a complete combination of characters of dorsal guard hair of *Moschiola indica* for species identification.

Joshi *et al.* (2012) reported a comparative trichology of Chital (*Axis axis*), Sambar (*Rusa unicolor*), Barking deer (*Muntiacus muntjak*) and Mouse deer (*Moschiola indica*) in India but, physical structure and surface structure of these species particularly *Moschiola indica* was not done and also no other hair characteristic features on this species are available in the literatures. Therefore, an attempt has been made to have detail structure of dorsal guard hair of this species. Methods of hair identification need exact identification keys. The single character of hair does not help for the species identification, as the hair characters often show high variance, but the combination characters may give significant values for identification of species (Brunner and Comman 1974; Teerink 1991). On the basis of morphological and microscopic characters dorsal guard hairs, the key characters of hair to identifying this species is presented in Table 1 along with microscopic photographs (Figs. 1).

Acknowledgements

I sincerely thank Dr. Kailash Chandra, Director, Zoological Survey of India, Kolkata for providing necessary facilities.

References

- [1] Bahuguna, A., Sahajpal, V., Goyal, S.P., Mukherjee, S.K. and Thakur, V. (2010) *CD version of forensic guide for identification of selected mammals from primary guard hair*. Wildlife Institute of India, Dehradun 438 pp.
- [2] Brunner, H. and Comman, B. 1(974) *The Structure of Hairs*. Inkata Press, Melbourne, Australia, 170 pp.

- [3] Chakraborty, R. and De, J.K. (2010) *Atlas on hairs Indian Mammals Part- I: Carnivora*: Published by the Director, Zoological Survey India, 141 pp.
- [4] De, J.K. (1993) Study of surface structure of hair of some Primates of Indian sub-continent. *Records of the Zoological Survey of India* 93, 31–34.
- [5] Joshi H.R, Gaikwad SA, Tomar M.P.S., and Shrivastava K. (2012) Comparative Trichology of Common Wild Herbivores of India. *Adv. Appl. Sci. Res.*, 3 (6):3455-3458.
- [6] Kamalakannan, M., De, J.K. & Manna, C.K. (2013) Identification of dorsal guard hairs surface structure of Indian chevrotain *Moschiola Indica* Gray, 1852 (Tragulidae: Artiodactyla: Mammalia). *Biolife* 1(3): 155–158
- [7] Koppiker, B.R. and Sabins, J.H. (1975) Identification of hairs of some Indian mammals. *Journal of Bombay Natural History and Society* 73: 5–20.
- [8] Mayer, W.V. (1952) The hair of California mammals with keys to the dorsal guard hairs of California mammals. *American Midland Naturalist* 38, 480–512.
- [9] Moore, T.D., Spence, L.E and Dugnolle, C.E. (1974) *Identification of the dorsal guard hairs of some mammals of Wyoming*. Game and Fish Department, Wyoming, 177 pp.
- [10] Rajaram, A. and Manon, R.K. (1985) A scanning electron microscopic study of the hair keratin of some animals of the Indian subcontinent - a preliminary report. *Journal of the Bombay Natural Society* 83: 427–429.
- [11] Sahajibal, V., Goyal, S.P. Singh, K. and Tahkur, V. (2010) Dealing wildlife offences in India: Role of the hair as Physical evidence. *International Journal of Trichology* 1 1: 18–26.
- [12] Sarkar, P.S., De, J.K. & Manna, C.K. (2011) Identification of dorsal guard hair of five species of the family Cercopithecidae (Primates: Mammalia). *Current science* 100, 1725–1728.
- [13] Stains, H.J. (1958) Field key to guard hair of Middle Western furbearers. *Journal of Wildlife Management* 22: 95–97.
- [14] Teerink, B.J. (1991) *Hair of West-European mammals atlas and identification key*. Cambridge: Cambridge University Press, 223 pp.
- [15] Wallis, R.L. (1993) A key for the identification of guard hairs of some Ontario mammals. *Canadian Journal of Zoology* 71, 587–591.

Table 1. Physical and microscopic characters of dorsal guard hairs of *Moschiola indica*

Macroscopic characteristics	
Coat colour	Speckled olive brown coat with clear white stripes and spots
Colour of dorsal guard hair	Bicoloured, <i>Base</i> : Davy's Gray; <i>Tip</i> : Vannila
No. of colour bands	2
Profile	Straight
Length (mm)	21.5–14.4 (19.2±2.2)
Width (µm)	66.4–69.7 (68.1±1.3)
Cuticular characteristics	
Scale position	Transversal
Scale patterns	Regular wave
Structure of scale margins	Smooth
Distance between scale margins	Near
Scale count/mm length of hair	163–256 (196±4.1)
Length of scale (µm)	43.2–50.2 (47.7±2.4)
Width of scale (µm)	11.5–21 (16.4±2.9)
Medullary characteristics	
Composition of medulla	Multicellular in rows
Structure of medulla	Wide medulla lattice
Margins of medulla	Straight
Width of medulla (µm)	56–65.6 (58.3±4.6)
Shape of cross-section	Oblong

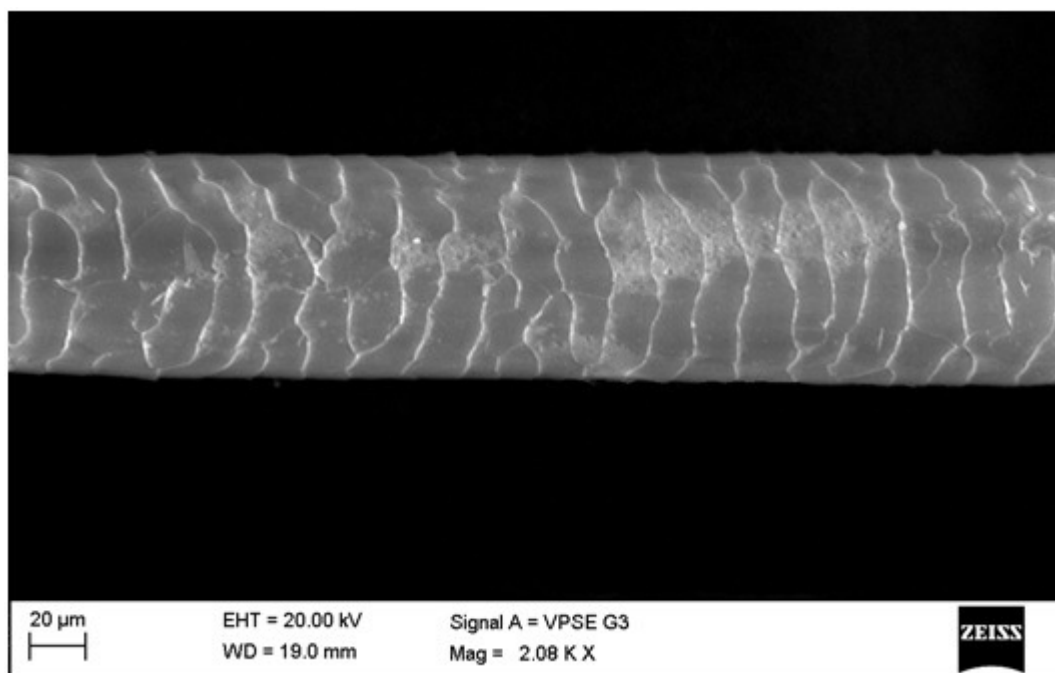


Figure 1. Scanning electron micrographs of cuticula of *Moschiola indica*

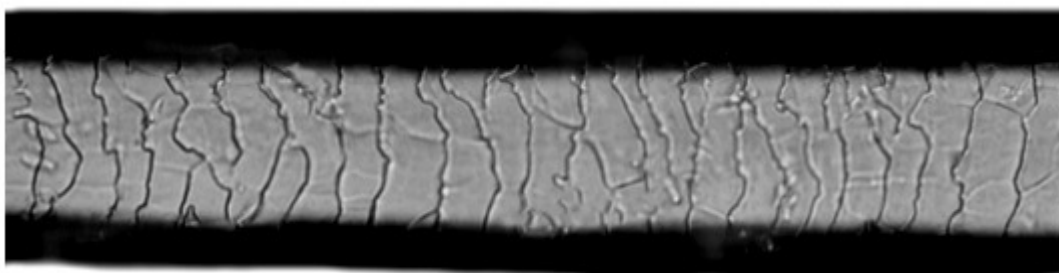


Figure 2. Cuticula (400X) of *Moschiola indica*



Figure 3. Medulla (400X) of *Moschiola indica*



Figure 4. Cross-section (400X) of *Moschiola indica*