



HAIR IDENTIFICATION KEY OF DOMESTICATED HORSE (*Equus ferus*) FROM THE SAURASHTRA REGION OF THE GUJARAT, INDIA

Dr. Bhupat B. Radadiya*¹ and Vibhuti B. Raval²

^{1,2}Shree M. & N. Virani Science College, Biology Department, Saurashtra University, Rajkot 360005, Gujarat State, India.

*Corresponding Author: Dr. Bhupat B. Radadiya

Shree M. & N. Virani Science College, Biology Department, Saurashtra University, Rajkot 360005, Gujarat State, India.

Article Received on 20/02/2018

Article Revised on 11/03/2018

Article Accepted on 01/04/2018

ABSTRACT

The present study was carried out to identify domesticated species Kathiawadi Horse belonging to Equidae family of the order Perissodactyla (odd-toed ungulate) with their macro- microscopic features of dorsal guard hair characteristics. The Kathiawadi Horse is well known and morphologically distinctive species found to be distributed largely in the areas of Kathiawadi plateau within Saurashtra region of the Gujarat State. In current study we collected control hair samples from the horse owners living in the Junagadh city. We analyzed thirty random guard hairs from dorsal region of the species and systematically studied under microscopes to avail the genuine and pictorial evidence for the carnivore scat analysis through this key. In this study we used the identifiable qualitative and quantitative features of Cuticle as well as Medulla. **Medullary Index (MI)** found in Kathiawadi Horse is $0.53 \pm 0.01 \mu\text{m}$.

KEYWORDS: Guard Hair, Kathiawadi plateau, Saurashtra, Equidae, Perissodactyla, Scat, etc.

INTRODUCTION

Trichology is the branch of science which deals with scientific study on hair and this field initiated in the mid 1800s. Mammal hairs play an important role in waterproofing, thermoregulation, body shape maintenance, as well as protection from the variety of pollution. Certainly the discovery of mammal hair was earlier achieved by **Hausman** in 1920. Later on many people carried out the study on variety of aspects of hair both on human and animal hair. There are mainly two types of mammalian hair found: Guard hairs that are usually thick and bristly and fine hairs which are curled and thin comparatively (**Eunok Lee et al, 2014**).

The domesticated species Kathiawadi Horse belonging to Equidae family of the order Perissodactyla. Perissodactyla includes exclusively large terrestrial herbivores which commonly known as perissodactyls or odd-toed ungulates. Hence, the order is extremely diverse. The animal of the Perissodactyla order also sometimes referred as odd-hoofed or Odd-toed mammals. Hair analysis through their morphological Cuticular scale characteristics and medullary features has been differential among mammalian species. The technique was much older but gets refined and more precise with advancement of instrument and technology with time. The scale count and scale pattern of the hair found to be unique for each species. For that reason helpful to recognize the hair of unknown species by

considering their several external and internal morphological factors studied by **Ashvinkumar et al** in 2017. It is the best effective techniques widely used in the forensic as well as in the field of ecology. The distinctive medullary index for every species is first and foremost suitable for species confirmation and useful to identify unknown hair samples as well as for the study of feeding ecology of large carnivore animals by their scat analysis within and around the protected areas.

MATERIALS AND METHODS

In this study guard hair of Kathiawadi Horse were collected from the horse owner living in Junagadh city of Gujarat State of India during field survey. Further randomly picked thirty dorsal guard hairs of the species thoroughly evaluated under microscope.

After collection of hairs of the species were properly washed in running water for a number of times to remove dirt. Then washed hairs were cleaned and degreased in acetone. Then randomly picked up thirty hairs from the samples and it were examined in detail. First each hair were embedded in Gelatin layered microscopic slide or by using Nail paint imprint (or Cellulose sheet) technique for scale imprinting. Then it was analyzed for microscopic factors using ZEISS, Fluorescence light microscope. The microscope facilitated with important measurement software with the add-on camera namely: Axiocam Imager proven very

helpful for quantitative and qualitative features of the hair (**Palenik, 1983**). First the hair studied under 10X view, then in 40X view for detailed morphometric study.

Then morphological external features of the hair shaft were recorded with appropriate details and measurement. Afterward internal morphological features of the hair medulla were studied thoroughly and recorded separately in the data book. Then data analysis carried out using Microsoft excels, version 2007. On the basis of all

external and internal morphological as well as quantitative features of the guard hair of the species confirmed.

RESULT AND DISCUSSION

Different Morphological and quantitative features of the guard hair of Kathiawadi Horse species studied in detail. The mean value as well as standard deviation regarding various features of hair shaft and medulla are summarized in following tables.

Table 1: Morphological features of Kathiawadi Horse guard hair.

SR. NO.	SPECIES	MEDULLA PATTERN	SCALE PATTERN	COLOUR OF HAIR (NAKED EYE)	HAIR SURFACE
1	Kathiawadi Horse	Simple medulla (amorphous)	Regular & Irregular wave	Brown, White, Black	Smooth

There are several important morphological features to be considering for the identification and confirmation of the hair for particular species. Here Kathiawadi Horse has regular & irregular wave type of scale and wide and

simple medulla pattern. (Table 1, Fig 1). The Kathiawadi Horse can be found in three different morph namely Black, White and Brown so, the hair colour varied accordingly.

Table 2: Systematic position of the Kathiawadi Horse.

SR. NO.	SPECIES	ORDER	FAMILY	GENUS	SPECIES
1	Kathiawadi Horse	Perissodactyla	Equidae	<i>Equus</i>	<i>ferus</i>

The Kathiawadi Horse falls under Perissodactyla order and Equidae family with the genus and species *Equus ferus* respectively.

Figure 1-2. Photographs scale and medulla pattern of the Kathiawadi Horse hair.

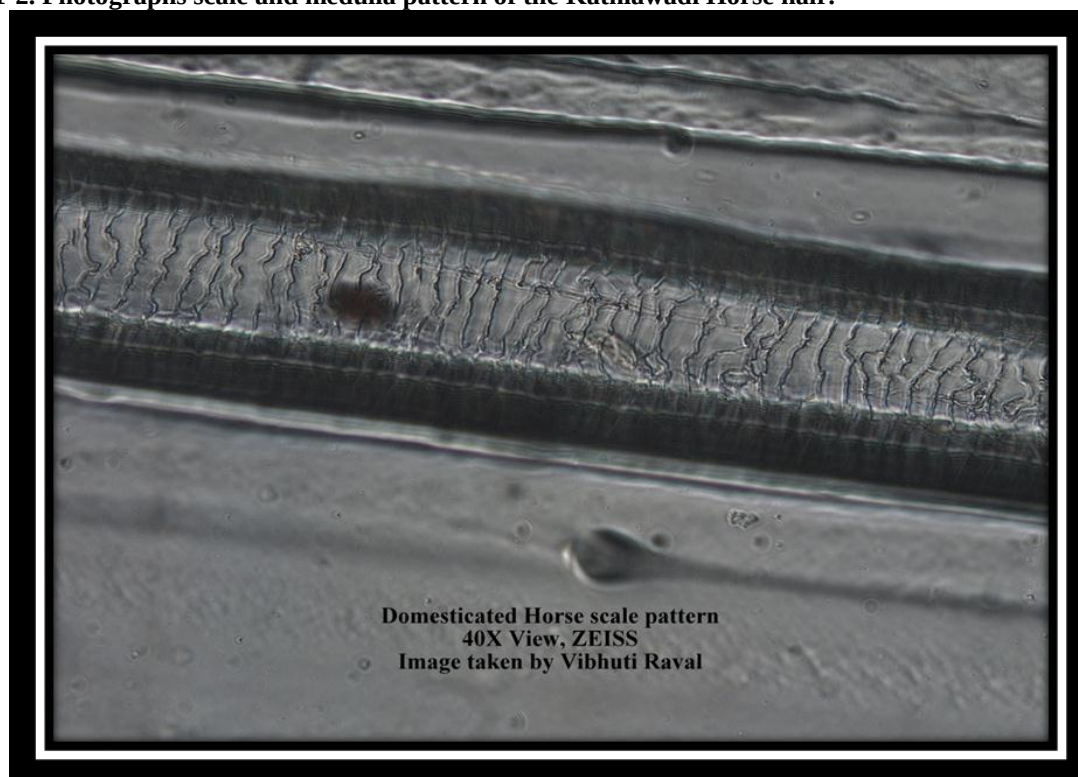


Figure 1: Scale pattern of the dorsal guard hair of *Equus ferus*.



Figure 2: Medulla pattern of the dorsal guard hair of *Equus ferus*.

Internal morphological factors of the hair medulla

Table 3: Different factors of Hair of Kathiawadi Horse species.

SR. NO.	SPECIES	WHOLE HAIR LENGTH [AVERAGE (cm)]	SHAFT [AVERAGE (μm)]	MEDULLA [AVERAGE (μm)]	MEDULLARY INDEX [AVERAGE (MI)]	STANDARD ERROR (MI)
1	Kathiawadi Horse	1.3	1.73	10	$0.53 \pm 0.02 \mu\text{m}$	0.01

Medullary index is the specialized feature of the guard hair. Each and every species of the mammals can be identified on the basis of their medullary index (Table 3,

Figure 3). The **Medullary Index (MI)** found in Kathiawadi Horse is 0.53 ± 0.02 .

Standard Error bar for the different factors of the dorsal guard hair of Kathiawadi Horse

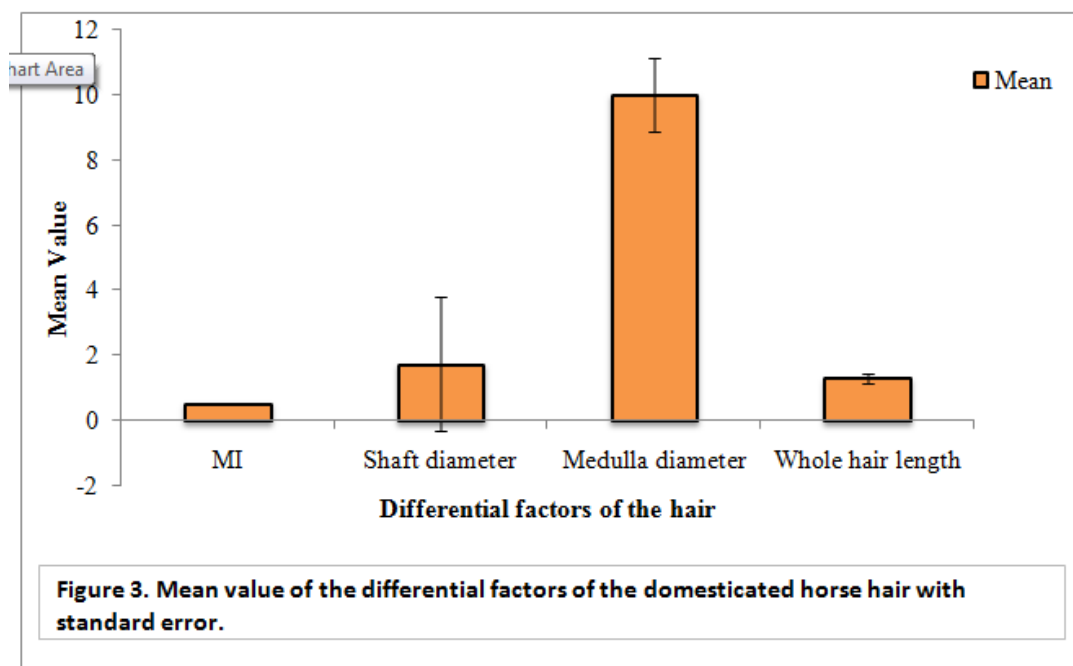


Figure 3. Mean value of the differential factors of the domesticated horse hair with standard error.

Medullary index of the Kathiawadi Horse species revealed that there was very minute deviation in the MI (0.02), followed by Whole hair length (0.26), followed by Medulla diameter (2), and followed by (3.57).

CONCLUSION

On the basis of various morphological features like hair colour, texture, cuticle scale type and medulla type along with the several measuring features of the hair such as medulla diameter, shaft diameter and MI to identify and confirm the hair of the species. The Kathiawadi Horse hair texture is smooth and varied in colour according to morph of species.

The quantitative features of the guard hair of animal species are distinctive and species specific. On the basis of medulla type it has simple medulla type. The species has regular and irregular wave type of scale which is very common in many animals but with the help of MI it can be easy to confirm the species without difficulty as it is $0.53 \pm 0.02 \mu\text{m}$. These differential features of the hair are largely suitable and authenticated, hence broadly used in the various field namely: ecology, field of forensic science, field of wildlife and Ethology for the hair identification of species of interest.

ACKNOWLEDGEMENTS

I sincerely thank the following people for their reliable support and help during my research work:

- Dr. B. B. Radadiya (Ph.D. Guide), Biology department, Shree M. & N. Virani Science College, Rajkot.
- Dr. A. P. Singh (CCF) for their timely guidance throughout my research work.
- Ashvinkumar Italiya, Yadav sir, Chand sir & Joshi sir for the help during my laboratory work.
- Dolakiya sir and Shradha madam, Food testing laboratory-Junagadh
- Vala sir (Zoo Director), Sakkarbaug Zoo-Junagadh.
- My father for their great company in the field.

REFERENCES

1. Ashvinkumar H. Italiya, Niha Ansari and Shobhana K. Menon (2017) **Non destructive techniques for individualizing porcupine quillthrough trace evidence analysis**, international Journal of Current Advanced Research, 6(12): 8228-8232.
2. Eunok Lee, Tae-young Cho, Donggul Woo, Mi-sook Min, Shoei Sugita and Hang Lee (2014) **Species identification key of Korean Mammal hair**, Wildlife Science, 76 (5): pages 667-675.
3. Hausman, L. (1920). **Structural characteristics of the hair of mammals**, Am. Nat., 54; 239-246.
4. Palenik S. (1983). **Light microscopy of medullary micro-structure in hair identification**, Microscope, 31: 129-137.