

HEMATOLOGY AND PHENOTYPIC CHARACTERIZATION OF MUDHOL HOUND

SURAJ KOUJALAGI*, CHANDRAKANT GALDHAR, RAJIV GAIKWAD, DHANANJAY PAWALKAR¹,
SHAILESH INGOLE², RAHUL DESHMUKH³, VIVEK KASRALIKAR⁴, DISHANT SAINI⁵,
ANIL SINDHUR⁶ and PRASHANT KURBET⁷

Dept. of Veterinary Clinical Medicine, Ethics & Jurisprudence, ¹Dept. of Veterinary Epidemiology and Preventive Medicine, ²Dept. of Veterinary Physiology, ³Dept. of Veterinary Animal Genetics and Breeding, ⁵Dept. of Veterinary Surgery and Radiology, Mumbai Veterinary College, Parel, Mumbai-400012, MAFSU, Nagpur (Maharashtra)

⁴Dept. of Veterinary Clinical Complex, Veterinary College Bidar-585401, Karnataka

⁶Government Veterinary Polyclinic, Koppal-583231, Karnataka; ⁷Veterinary dispensary-Avaradi-591312, Karnataka

Receive: 01.12.2023; Accepted: 13.02.2024

ABSTRACT

In the present study, phenotypic characterization and haemato-biochemical studies of Mudhol Hound, a popular dog breed of Karnataka and Maharashtra was undertaken. Mudhol hound is also known as the Maratha Hound, and the Caravan Hound. During the survey, 14 physical morphometric traits were recorded of 30 adult KCI registered Mudhol Hounds (aged above 1 year and less than 10 year). Thirty Mudhol Hound owners were contacted in order to get information about animal routine management. Mudhol Hounds are compact, medium to large sized, with a slender and slim body, skin coloured nostrils and eyelids, dangled ears, a straight to arced tail and a straight upper line. The average body weight was around 27.7 ± 1.2 kilogram for males and 26.2 ± 0.8 kilogram for females and was obtained from owner's recent records. The values were analysed by Bars and Whiskers. The mean height at wither was 73.1 ± 0.88 cm, mean length of head was 28.2 ± 0.33 cm, mean girth of chest was 68.2 ± 1.27 cm and mean length of tail was 57.55 ± 0.81 cm. The mean haemoglobin values of Mudhol Hounds was found to be 14.76 ± 0.46 gram percent and that of mean platelet count was recorded to be $3.83 \pm 0.36 \times 10^6$ /cmm. The hounds were fed with both vegetarian and non-vegetarian food and were fed thrice a day. The diet consists of roti/chapati soaked in milk, rice, boiled meat, boiled egg and mixed grain diet. Hounds were regularly dewormed and vaccinated as per standard schedule. The Mudhol Hounds are used for guarding in the farm house, chasing out the vertebrate pests from farms. Mudhol hound being a part of Border Security Force, recently involved in security of Prime Minister and its popularity, there is a need of recording of data and documentation.

Keywords: Haematology, Hound, Morphometry, Mudhol

How to cite: Koujalagi, S., Galdhar, C., Gaikwad, R., Pawalkar, D., Ingole, S., Deshmukh, R., Kasralikar, V., Saini, D., Sindhur, A. and Kurbet, P. (2026). Hematology and phenotypic characterization of Mudhol Hound. *Haryana Veterinarian*. 65(1): 89-95.

Dog (*Canis lupus familiaris*) is known to be the first animal domesticated by humans. Popular Indian dog breeds include the Rampur Hound, Kanni, Himalayan sheep dog, Chippiparai, Rajapalayam, Mudhol Hound, and Bhutia sheep dogs (Gandhi 2010). These Indian dog breeds were primarily used for hunting, shepherding and guarding. Mudhol Hound is one among the three NBAGR registered Indian dog breeds with the accession number "INDIA_DOG_0800_MUDHOL_HOUND_19003". Mudhol is town situated in Bagalkot district of North Karnataka. Different body confirmation and with differing functional relationship has been widely observed in different breeds (Latorre *et al.*, 2011, Yakubu *et al.*, 2010, Zaitoun *et al.*, 2005,). A hound is a breed of dog used for hunting, particularly one that can follow scent. Originally utilized for hunting, the Hound breeds were known for their strong sense of scent, exceptional speed, or both. Over the years, a number of researchers have drawn attention to the potential connection between morphometric characteristics and the reason a population was bred. However, morphometric characterization and recording of native dog breeds have not received enough

attention. In order to characterize the Karnataka Mudhol Hound and create breed-specific morphometric descriptions, the current study was conducted.

MATERIALS AND METHODS

A questionnaire was created to gather data on the breed, management techniques, morphometric and physical characteristics, and the breed's usefulness in its natural environment. The study on Mudhol hound population was undertaken in and around Mudhol town of Bagalakote district in Karnataka state. The data was gathered using a random sample technique. A total of 14 morphometric measurements on 30 adult animals (15 male and 15 female) were recorded during the study. The weight of the dogs was noted from owner and the Kennel Club of India's registration certificates were used to determine the animals' ages. The morphometric measurements used in this investigation were in accordance with research by Gonzalez *et al.* (2011) and Sutter *et al.* (2008). A graded measuring tape was used to measure the animals' morphometric characteristics as they stood on a level surface. Body length, height at withers, height at rump, chest girth, abdominal girth, head length, tail length, snout

*Corresponding author: surajck11@gmail.com

length, face length, ear length, front pastern, rear pastern elbow to withers, and height at elbow in centimetres were among the morphometric characteristics being studied. (Fig. 1). The hemogram was done using auto analyzerDiatronAbacus.The data were analysed using bars and whiskers in Microsoft excel 2019.

Fourteen discrete body measurements were collected from each of 30 dogs depicted in Fig. 1 serially and their Morphologic descriptions are as below.

1. Height at withers- The linear distance from the ground to scapula (withers).
2. Height at Rump- The linear distance from the ground to the dorsal-most point of rump.
3. Snout length- The distance along the skull from the rostral end of the planum nasale to dorsal plane between eyes.
4. Head length- The distance along the skull from the top to the external occipital protuberance to dorsal plane between the eyes.
5. Face length- Head length + snout length.
6. Body length- The length of the body between the pin bone and the anterior portion of the sternum.
7. Chest girth- The circumference of the deepest part of the thoracic cavity.
8. Abdomen girth- The circumference of the body at abdomen.
9. Fore limb pastern diameter- The circumference of the fore limb at the pastern region.
10. Hind limb pastern diameter- The circumference of the hind limb at the pastern region.
11. Ear length- Length from base to tip of ear pinna.
12. Tail length- Length from base to tip of tail.
13. Height at elbow- Length from ground to elbow joint.
14. Elbow to withers- Distance from withers to elbow joint.

RESULTS AND DISCUSSION

Face Length

The mean length of face of Mudhol hound was recorded to be 28.28 ± 0.33 cm. Fig. 2 depicts the box plot of length of face of Mudhol hounds, where 'T bars' represent the range from 24 to 32 cm, interquartile range, 25th to 75th percentile, as 27.37 to 29.62 cm with median as 28.50 cm. Gonzalez *et al.* (2014) reported the face length of Spanish sight hounds as 23.58 ± 0.15 cm in males and 22.31 ± 0.16 cm in females. Milivoje *et al.* (2020) published the face length of Turkish sighthounds as 23.27 ± 0.11 cm

and 22.29 ± 0.13 cm for males and females, respectively. Raja *et al.* (2017) measured the face length of Rajapalayam hound and noted to be 21.30 ± 0.35 cm in male hounds and 19.41 ± 0.34 cm in the female hounds.

Snout / Muzzle Length

The mean length of snout of Mudhol hound was recorded to be 11.41 ± 0.12 cm. Fig. 3 depicts the box plot of length of snout of Mudhol hounds, where 'T bars' represent the range from 10 to 13 cm, interquartile range, 25th to 75th percentile, as 11 to 13 cm with median as 11 cm. Gonzalez *et al.* (2014) reported the snout length of Spanish sight hounds as 10.57 ± 0.14 cm in males and 9.89 ± 0.14 cm in females. Milivoje *et al.* (2020) published the snout length of Turkish sighthounds as 7.78 ± 0.10 cm and 7.35 ± 0.13 cm for males and females, respectively. Raja *et al.* (2017) measured the snout length of Rajapalayam hound and noted to be 10.73 ± 0.25 cm for male hounds and 10.44 ± 0.18 cm for the female hounds.

Head / Frontal Length

The mean length of head of Mudhol hound was recorded to be 16.85 ± 0.26 cm. Fig. 4 depicts the box plot of length of head of Mudhol hounds, where 'T bars' represent the range from 15 to 19 cm, interquartile range, 25th to 75th percentile, as 16.5 to 18 cm with median as 17 cm. Gonzalez *et al.* (2014) reported the face length of Spanish sight hounds as 13.59 ± 0.15 cm and 12.81 ± 0.14 cm for males and females, respectively.

Chest Girth

The mean girth of chest of Mudhol hound was recorded to be 68.28 ± 1.27 cm. Fig. 5 depicts the box plot of girth of chest of Mudhol hounds, where 'T bars' represent the range from 54 to 78 cm, interquartile range, 25th to 75th percentile, as 62 to 75.12 cm with median as 68 cm. Gonzalez *et al.* (2014) reported the chest girth of Spanish sight hounds as 70.21 ± 0.57 cm in males and 66.93 ± 0.45 cm in females. Milivoje *et al.* (2020) published the chest girth of Turkish sighthounds as 64.96 ± 0.54 cm and 61.22 ± 0.49 cm for males and females, respectively. Raja *et al.* (2017) measured the chest girth of Rajapalayam hound and noted to be 67.85 ± 0.60 cm for male hounds and 63.38 ± 0.63 cm for the female hounds.

Abdomen Girth

The mean girth of abdomen of Mudhol hound was recorded to be 43.66 ± 0.30 cm. Fig. 6 depicts the box plot of girth of abdomen of Mudhol hounds, where 'T bars' represent the range from 40 to 46 cm, interquartile range, 25th to 75th percentile, as 42 to 45 cm with median as 44 cm. Raja *et al.* (2017) measured the abdomen girth of Rajapalayam hound and noted to be 48.95 ± 1.02 cm and 46.55 ± 0.71 cm for males and females, respectively. Mudhol hound was observed to be comparatively slim at

abdomen when compared to Rajapalayam hound.

Body Length

The mean length of body of Mudhol hound was recorded to be 73.65±0.88 cm. Fig. 7 depicts the box plot of length of body of Mudhol hounds, where ‘T bars’ represent the range from 65 to 84 cm, interquartile range, 25th to 75th percentile, as 71 to 78 cm with median as 72 cm. Gonzalez *et al.* (2014) reported the body length of Spanish sight hounds as 67.83±0.53 cm in males and 65.02±0.55 cm in females. Milivoje *et al.* (2020) published the body length of Turkish sighthounds as 61.73±0.33 cm and 58.64±0.41 cm for males and females, respectively. Mudhol hound comparatively measures lengthier than other two hounds. Raja *et al.* (2017) measured the body length of Rajapalayam hound and noted to be 58.95±0.49 cm for male hounds and 55.95±0.65 cm for the female hounds.

Table 2. The Mean ± SD Haematological values of different Hounds

Sr. No.	Parameters	Present study Mudhol Hound	Uhrikova <i>et al.</i> (2013)			
			Grey Hound	Saluki Hound	Sloughi Hound	Pharaoh Hound
1.	Hemoglobin (g/dl)	14.76 ± 2.52	19.1 ± 1.5	18.5 ± 2.2	18.9 ± 1.7	17.7 ± 2.0
2.	Packed Cell Volume (%)	44.4 ± 11.80	56.20 ± 4.0	55.0 ± 5.7	56.5 ± 4.9	52.80 ± 4.8
3.	Total Erythrocyte Count (x 10 ⁶ /cmm)	7.06 ± 1.01	7.7 ± 0.5	8.0 ± 0.8	8.1 ± 0.9	7.5 ± 0.7
4.	Total Leucocyte Count (x 10 ³ /cmm)	12.24 ± 3.33	5.4 ± 1.8	7.6 ± 1.6	9.8 ± 1.7	8.8 ± 1.9
5.	Mean Corpuscular Volume (fL)	70.60 ± 11.88	73.4 ± 1.6	68.9 ± 2.6	70.2 ± 1.9	70.4 ± 2.8
6.	Mean Corpuscular Haemoglobin (pg)	22.23 ± 4.21	24.9 ± 0.8	23.2 ± 1.6	23.5 ± 1.2	23.6 ± 1.8
7.	Mean Corpuscular Haemoglobin Concentration (g/l)	33.54 ± 10.40	33.9 ± 1.2	33.5 ± 1.5	33.5 ± 1.5	33.5 ± 2.0
8.	Platelets (x 10 ⁵ /cmm)	3.83 ± 1.99	1.73 ± .49	2.11 ± 0.81	2.63 ± .92	3.02 ± 0.15

Tail Length

The mean length of tail of Mudhol hound was recorded to be 57.55±0.81 cm. Fig. 8 depicts the box plot of length of tail of Mudhol hounds, where ‘T bars’ represent the range from 50 to 65 cm, interquartile range, 25th to 75th percentile, as 54 to 62 cm with median as 57.5 cm. The Rajapalayam hound’s tail length was measured by Raja *et al.* (2017) and found to be 41.55±0.62 cm and 38.20±0.43 cm for male and female hounds, respectively. Mudhol hound tail was comparatively lengthier than other hounds.

Height at Withers

The mean height at withers of Mudhol hound was recorded to be 73.10±0.88 cm. Fig. 9 depicts the box plot of height at withers of Mudhol hounds, where ‘T bars’ represent the range from 64 to 82 cm, interquartile range, 25th to 75th percentile, as 70 to 77.25 cm with median as 72.50 cm. Gonzalez *et al.* (2014) reported the height at withers of Spanish sight hounds as 68.40±0.34 cm in males and 64.98±0.33 cm in females. Milivoje *et al.* (2020)

Table 1. Haematological values of Mudhol Hound

Sr. No.	Parameters	Mean ± SE values of Mudhol Hound	Reference Range (Merck’s Veterinary Manual, 2018)
1.	Hemoglobin (g/dl)	14.76 ± 0.46	12-18
2.	Packed Cell Volume (%)	44.4 ± 2.15	37-55
3.	Total Erythrocyte Count (x 10 ⁶ /cmm)	7.06 ± 0.18	5.50-8.50
4.	Total Leucocyte Count (x 10 ³ /cmm)	12.24 ± 0.60	6-17
5.	Neutrophils (%)	73.53 ± 2.00	62-87
6.	Lymphocytes (%)	22.4 ± 2.12	12-30
7.	Monocytes (%)	1.3 ± 0.18	2-10
8.	Eosinophils (%)	2.5 ± 0.37	3-10
9.	Basophils (%)	0.23 ± 0.09	0-0
10.	Platelets (x 10 ⁵ /cmm)	3.83 ± 0.36	2-5

published the height at withers of Turkish sight hounds as 62.02±0.30 cm and 58.38±0.34 cm for males and females, respectively. Raja *et al.* (2017) measured the height at withers of Rajapalayam hound and noted to be 63.10±0.91 cm and 58.91±0.57 cm for male and female hounds, respectively.

Height at Rump

The mean height at rump of Mudhol hound was recorded to be 73±0.86 cm. Fig. 10 depicts the box plot of height at rump of Mudhol hounds, where ‘T bars’ represent the range from 64 to 81 cm, interquartile range, 25th to 75th percentile, as 70 to 77.25 cm with median as 72.50 cm. Height at rump was found to be same as that of height at withers. Gonzalez *et al.* (2014) reported the height at rump of Spanish sight hounds as 66.57±0.39 cm in males and 64.19±0.34 cm in females. Milivoje *et al.* (2020) published the height at rump of Turkish sight hounds as 61.75±0.35 cm and 58.70±0.33 cm for males and females, respectively.

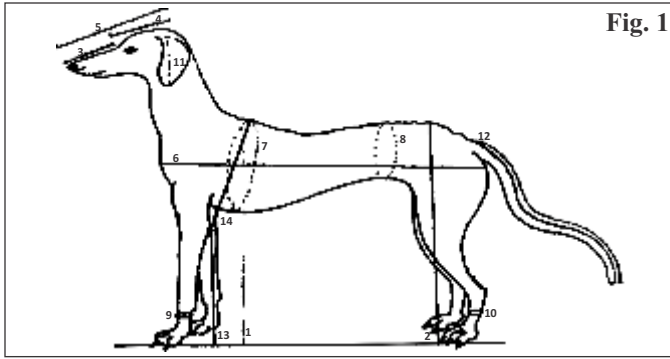


Fig. 1

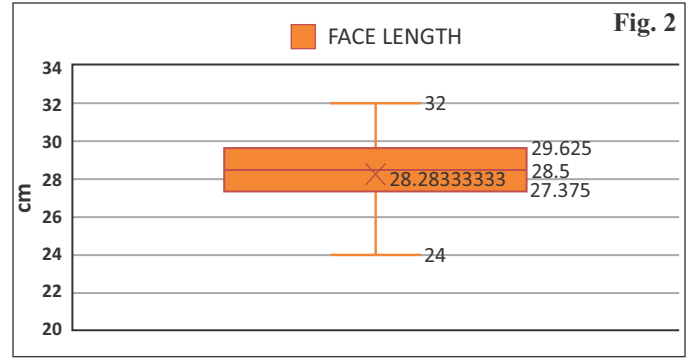


Fig. 2

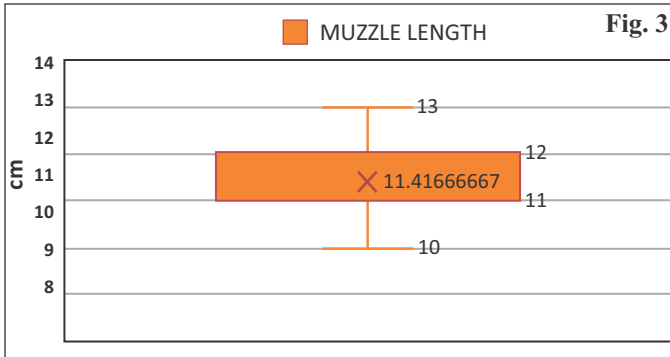


Fig. 3

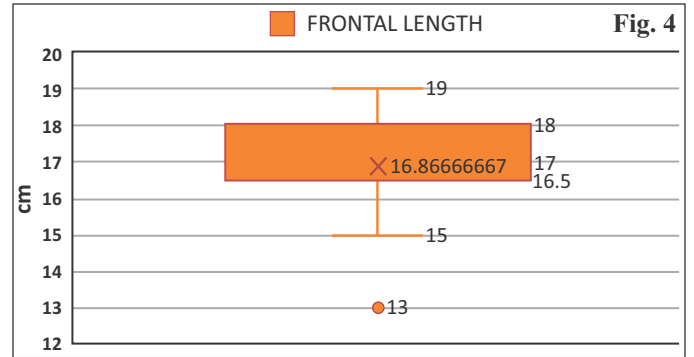


Fig. 4

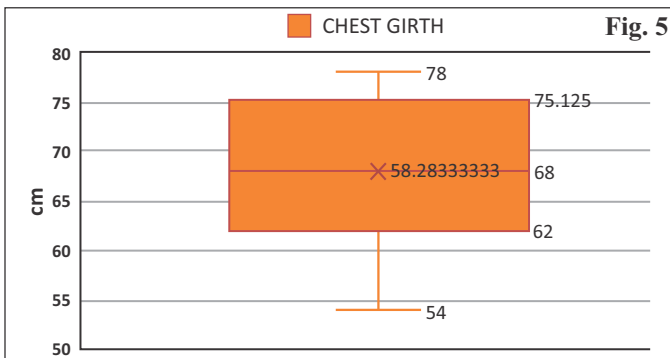


Fig. 5

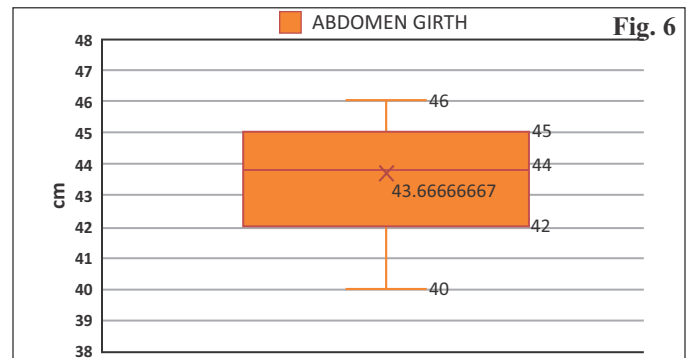


Fig. 6

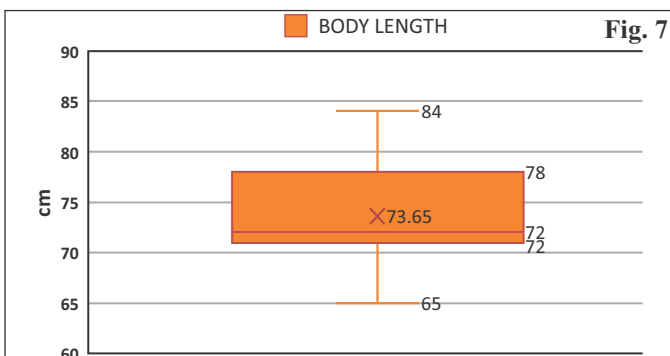


Fig. 7

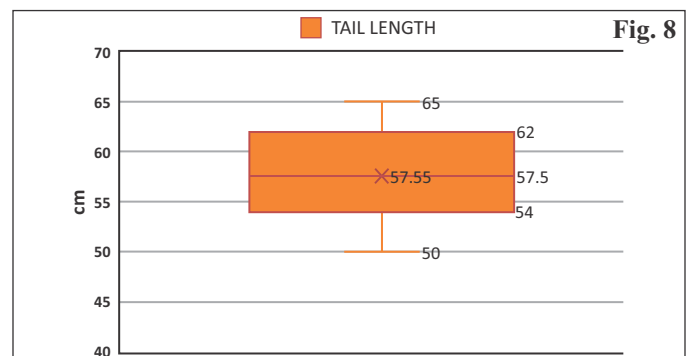


Fig. 8

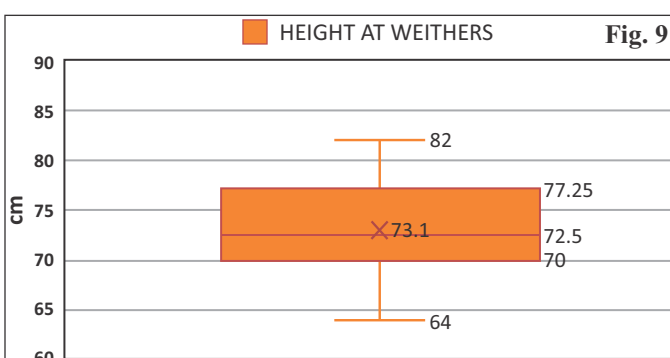


Fig. 9

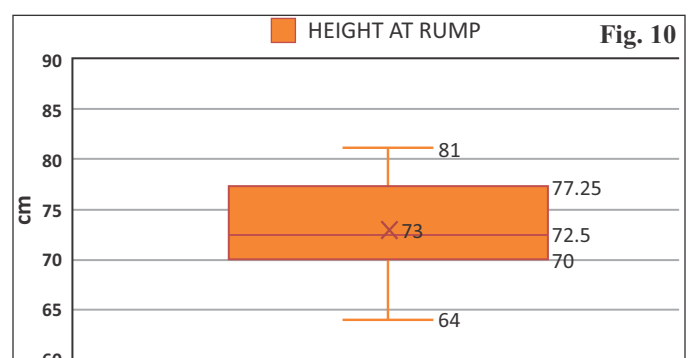
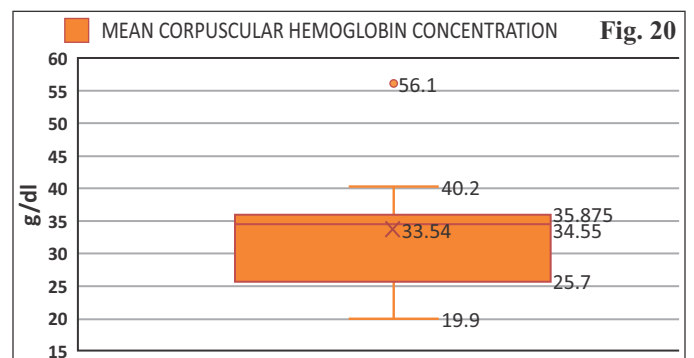
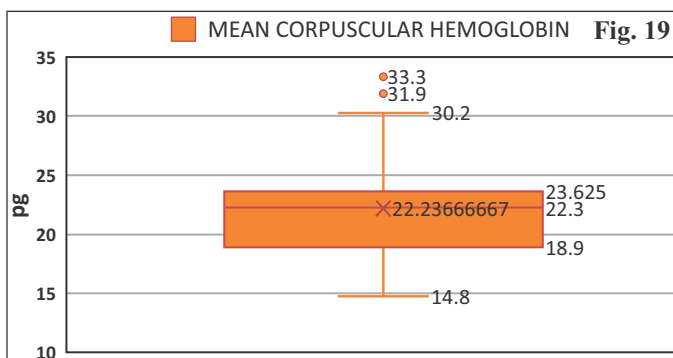
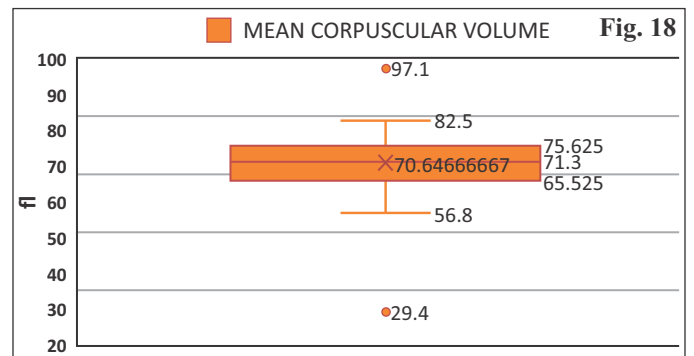
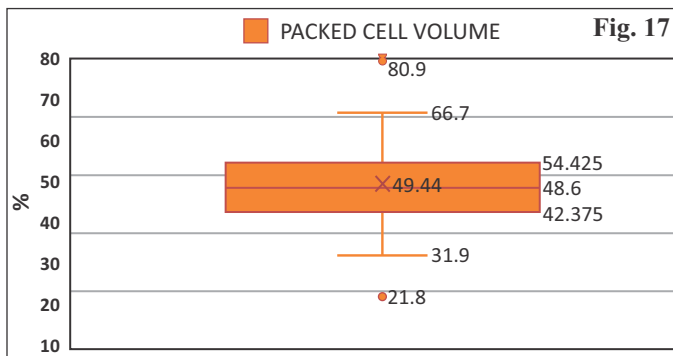
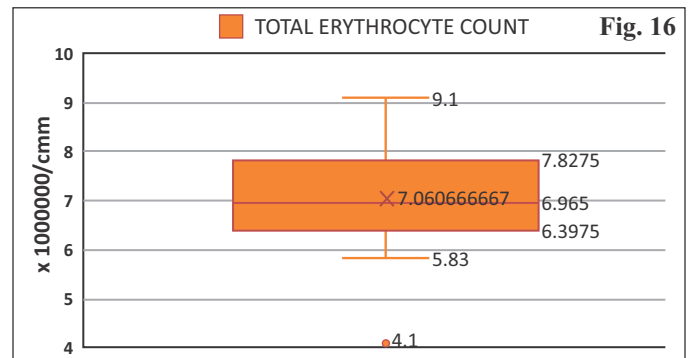
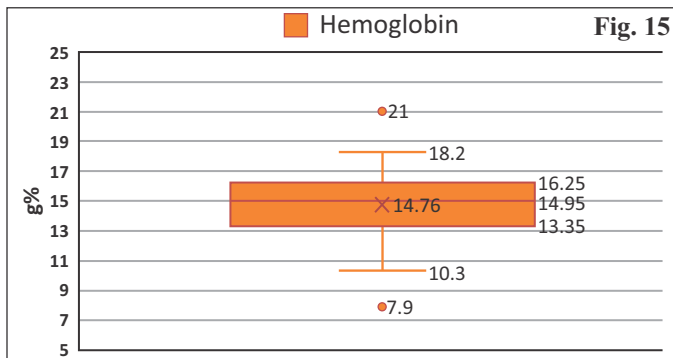
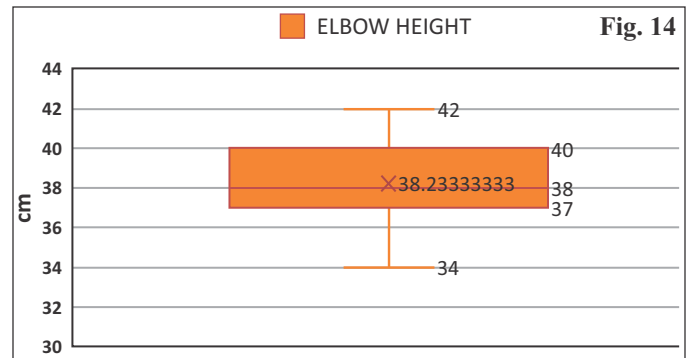
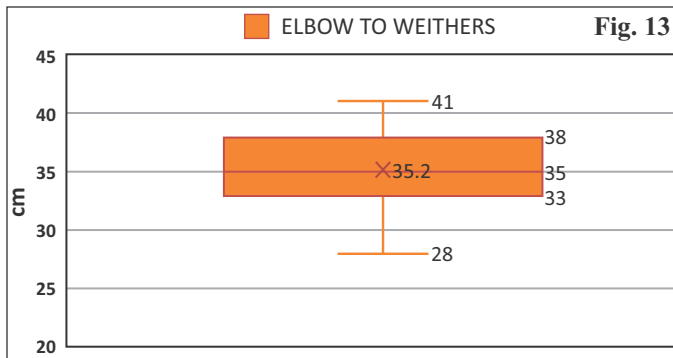
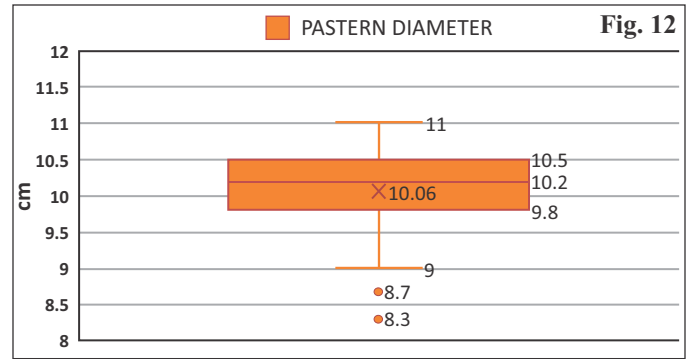
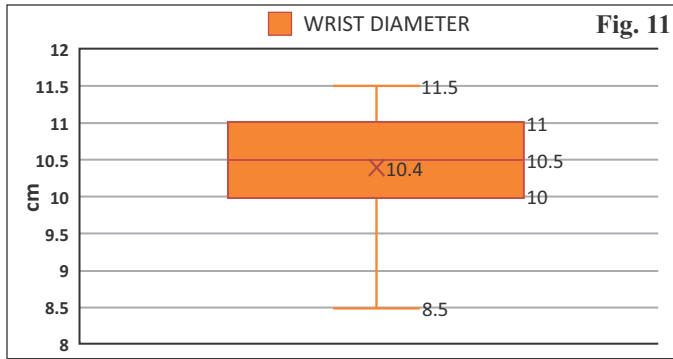
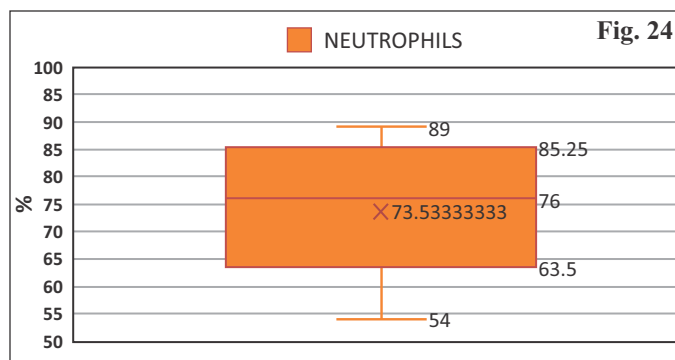
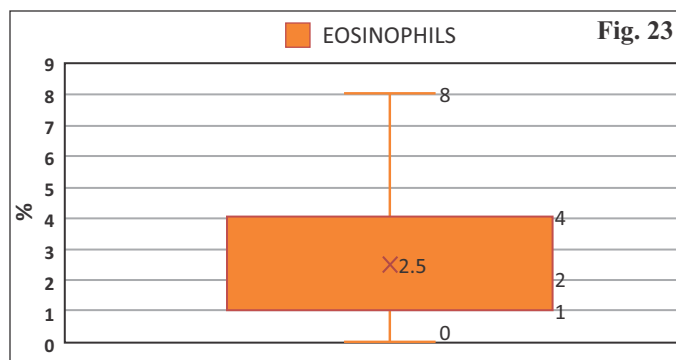
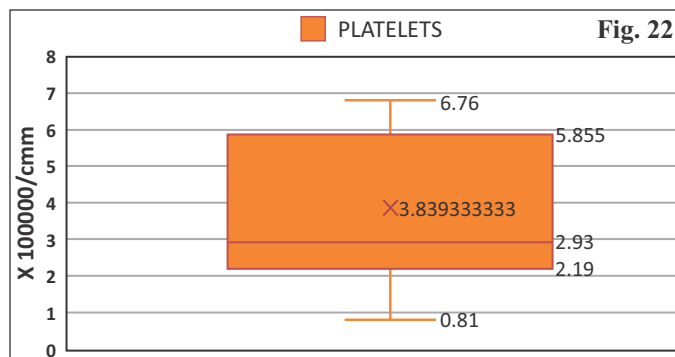
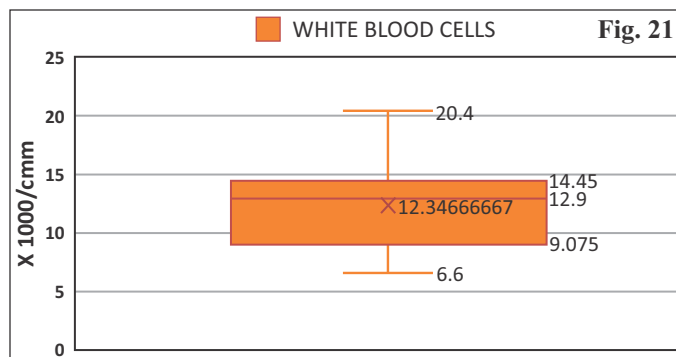


Fig. 10





Fore Limb Pastern Diameter

The mean fore limb pastern diameter of Mudhol hound was recorded to be 10.4 ± 0.11 cm. Fig. 11 depicts the box plot of fore limb pastern diameter of Mudhol hounds, where 'T bars' represent the range from 8.5 to 11.5 cm, interquartile range, 25th to 75th percentile, as 10 to 11 cm with median as 10.5 cm. Gonzalez *et al.* (2014) reported the forelimb pastern diameter of Spanish sight hounds as 9.75 ± 0.11 cm and 9.19 ± 0.14 cm for males and females respectively. Milivoje *et al.* (2020) published the forelimb pastern diameter of Turkish sight hounds as 9.71 ± 0.08 cm and 9.24 ± 0.09 cm for males and females, respectively.

Hind Limb Pastern Diameter

The mean hind limb pastern diameter of Mudhol hound was recorded to be 10.06 ± 0.11 cm. Fig. 12 depicts the box plot of hind limb pastern diameter of Mudhol hounds, where 'T bars' represent the range from 8.3 to 11 cm, interquartile range, 25th to 75th percentile, as 9.8 to 10.5 cm with median as 10.2 cm. The mean fore limb pastern diameter was comparatively bigger than mean hind limb pastern diameter of Mudhol hound. Gonzalez *et al.* (2014) reported the hindlimb pastern diameter of Spanish sight hounds as 9.17 ± 0.09 cm and 8.69 ± 0.13 cm in male and female hounds, respectively.

Elbow To Withers Length

The mean distance between elbow to withers of Mudhol hound was recorded to be 35.20 ± 0.52 cm. Fig. 13 depicts the box plot of length of distance between elbow to withers of Mudhol hounds, where 'T bars' represent the range from 28 to 41 cm, interquartile range, 25th to 75th

percentile, as 33 to 38 cm with median as 35 cm.

Height at Elbow

The mean height at elbow of Mudhol hound was recorded to be 38.23 ± 0.41 cm. Fig. 14 depicts the box plot of height at elbow of Mudhol hounds, where 'T bars' represent the range from 34 to 42, interquartile range, 25th to 75th percentile, as 37 to 40 cm with median as 38 cm. Milivoje *et al.* (2020) published the height at elbow of Turkish sight hounds as 32.99 ± 0.40 cm and 31.88 ± 0.21 cm in male and female hounds, respectively.

Ear Length

The mean length of ear of Mudhol hound was recorded to be 12.70 ± 0.18 cm. Milivoje *et al.* (2020) published the ear length of Turkish sighthounds as 12.00 ± 0.92 cm in males and 11.31 ± 0.71 cm in females. Raja *et al.* (2017) measured the ear length of Rajapalayam hound and noted to be 12.33 ± 0.23 cm and 11.46 ± 0.14 cm in male and female hounds, respectively. All the mean haematological values of Mudhol Hound were in accordance with the mean values of Mercks' Veterinary Manual presented in table 1.

Table 2 shows that Mudhol hounds had lower mean values of hemoglobin, total erythrocyte count and packed cell volume than other hounds, whereas, the total leucocyte counts and platelets were comparatively higher in Mudhol Hounds.

Haemoglobin (g/dl)

The mean $\pm$ SE haemoglobin value of Mudhol hound was recorded to be 14.76 ± 0.46 g/dl. Fig. 15 depicts the box plot of haemoglobin values of Mudhol hounds,

where 'T bars' represent the range from 10.3 to 18.2 g/dl, interquartile range, 25th to 75th percentile, as 13.35 to 16.25 g/dl with median as 14.95 g/dl.

Total Erythrocyte Count (x 10⁶/cmm)

The mean $\pm$ SE total erythrocyte count value of Mudhol hound was recorded to be $7.06 \pm 0.18 \times 10^6$ /cmm. Fig. 16 depicts the box plot of total erythrocyte count values of Mudhol hounds, where 'T bars' represent the range from 10.3 to 18.2×10^6 /cmm, interquartile range, 25th to 75th percentile, as 13.35 to 16.25×10^6 /cmm with median as 14.95×10^6 /cmm.

Packed Cell Volume (%)

The mean $\pm$ SE packed cell volume of Mudhol hound was recorded to be 44.4 ± 2.15 %. Fig. 17 depicts the box plot of packed cell volume values of Mudhol hounds, where 'T bars' represent the range from 31.9 to 66.7%, interquartile range, 25th to 75th percentile, as 13.35 to 16.25% with median as 48.6%.

Mean Corpuscular Volume (fl)

The mean $\pm$ SE mean corpuscular volume of Mudhol hound was recorded to be 70.64 ± 2.17 fl. Fig. 18 depicts the box plot of mean corpuscular volume values of Mudhol hounds, where 'T bars' represent the range from 56.8 to 82.5 fl, interquartile range, 25th to 75th percentile, as 65.5 to 75.62 fl with median as 70.64 fl.

Mean Corpuscular Haemoglobin (pg)

The mean $\pm$ SE mean corpuscular haemoglobin of Mudhol hound was recorded to be 22.23 ± 0.76 pg. Fig. 19 depicts the box plot of mean corpuscular haemoglobin values of Mudhol hounds, where 'T bars' represent the range from 14.8 to 30.2 pg, interquartile range, 25th to 75th percentile, as 18.9 to 23.62 pg with median as 22.3 fl.

Mean Corpuscular Haemoglobin Concentration (g/dl)

The mean $\pm$ SE mean corpuscular haemoglobin concentration of Mudhol hound was recorded to be 33.54 ± 1.89 g/dl. Fig. 20 depicts the box plot of mean corpuscular haemoglobin concentration values of Mudhol hounds, where 'T bars' represent the range from 19.9 to 40.2 g/dl, interquartile range, 25th to 75th percentile, as 25.7 to 35.87 g/dl with median as 34.93 g/dl.

White Blood Cells/ Total Leucocyte count (x 1000/cmm)

The mean $\pm$ SE total leucocyte count of Mudhol hound was recorded to be $12.34 \pm 0.60 \times 1000$ /cmm. Fig. 21 depicts the box plot of total leucocyte count values of Mudhol hounds, where 'T bars' represent the range from 6.6 to 20.4×1000 /cmm, interquartile range, 25th to 75th percentile, as 9.07 to 14.45×1000 /cmm with median as 12.9×1000 /cmm.

Platelets (x 100000/cmm)

The mean $\pm$ SE total leucocyte count of Mudhol hound was recorded to be $3.83 \pm 0.36 \times 100000$ /cmm. Fig. 22 depicts the box plot of platelet values of Mudhol hounds, where 'T bars' represent the range from 0.81 to 6.76×100000 /cmm, interquartile range, 25th to 75th percentile, as 2.19 to 5.85×100000 /cmm with median as 2.93×100000 /cmm.

CONCLUSION

Results of 14 morphometric measurements reveal that the values of Mudhol hound are in similar range as that of Spanish sight hound and Turkish sight hound. As several researchers have mentioned the importance of relationship between morphometric traits and the purpose of dog, such results are helpful in setting the standards for particular breed.

REFERENCES

- Gandhi M. (2010). Breeds of Dog in India. The Bihar Times, dated-11.12.2010.
- González, A., Luque, M., Herrera, M., González, C., Angón, E. and Rodero, E. (2014). Usefulness of discriminant analysis in the morpho functional classification of Spanish dog breeds. *Arch. Animal Breeding*. **57**(1): 1-16.
- Latorre, E., Uribe, H., Martinez, M.E., Calderon, C. de. La. and Barra, R. (2011). Morphology differentiation and structural functionality of ewes due to incomplete crossbreeding. *Int. J. Morphol.* **29**: 954-959.
- Merck's Veterinary Manual, (11th Edn.) (2018). Whitehouse Station, NJ: Merck & Co., Inc.
- Milivoje, U., Milosava, M., Darko1, D. and Umit, O. (2020). Use of morphometric variables for differentiating breed variations in turkishtazi (Sighthound) population. *Pakistan J. Zool.* **52**(5): 1765-1770.
- Nbagricar.gov.in/en/home. (2022)
- Raja, K.N., Singh, P.K., Mishra, A.K., Ganguly, I., Devendran, P. and Kathirvel, S. (2017). Phenotypic characterization of Rajapalayam dog of Southern India. *Indian J. Anim. Sci.* **87**(4): 447-451.
- Sutter, N.B., Mosher, D.S., Gray, M.M. and Ostrander, E.A. (2008). Morphometrics within dog breeds are highly reproducible and dispute Rensch's rule. *Mamm. Genome*. **19**(10-12): 713-23.
- Uhríkova, I., Lacnakova, A., Tandlerova, K., Kucharova, V., Rehakova, K., Janova, E. and Doubek, J. (2013). Haematological and biochemical variations among eight sighthound breeds. *Aus. Vet. J.* **91**(11): 452-459.
- Yakubu, A., Idahor, K.O., Haruna, H.S., Wheto, M. and Amusan, S. (2010). Multivariate analysis of phenotypic differentiation in Bunaji and SokotoGudali cattle. *Acta. Agric. Slov.* **96**: 75-80.
- Zaitoun, I.S., Tabbaa, M.J. and Bdour, S. (2005). Differentiation of native goat breeds of Jordan on the basis of morphostructural characteristics. *Small Rumin. Res.* **56**: 173-182.