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Studies on morphological characteristics and production performance of red Kandhari cattle in Pathri tahsil of Parbhani district

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Abstract

The present study entitled “Studies on morphological characteristics and productive performance of Red Kandhari cattle in Pathri tehsil of Parbhani district” was conducted by selecting 50 cattle of different age groups *i.e.*, upto 1 year, 1 to 2 year, 2 to 3 year and above 3 years age groups and recorded with the mean value. The cattle were mostly found with bowl shaped udder, cylindrical shaped teats and small size of milk vein. The lactational milk yield of Red Kandhari cattle was found to be 534.7 ± 6.97 kg, average lactation period was of 252.68 ± 1.52 days and average milk yield per day was 2.74 ± 0.08 kg. The milk production performance of Red Kandhari cattle is fair, hence, it can be considered as the draught breed of cattle and by adopting better management and nutrition practices its production can be increased.

Keywords: Red Kandhari cattle, production performance, lactation period, lactation milk yield, daily milk yield, morphological characters

Introduction

The global cattle population amounted to about one billion head in 2022, up from approximately 996 million in 2021 (Shahbandeh, M. 2021) [7]. India has world's largest livestock population accounting for over 37.28 percent of cattle, 21.23 percent of buffalo, 26.40 percent of sheep (Sonavale *et al.* 2020) [9]. Average milk production of non-descript cow is about 1.50 kg/day. Although milk production of non-descript cattle is low, it shows high adaptation in different agro-climatic condition in India. There is variation for selection and improvement for milk production. Efforts are made to improve production performance of non-descript cattle through cross breeding with exotic cattle. However, it has not yielded desirable level as it possesses problem in maintaining exotic inheritance in field condition. Further, high disease incidence, repeated breeding, cow heat tolerance, difficulty in use of crossbred for work, high cost of maintains of some of problems experienced by farmer. It is therefore, necessary to improve upon the non-descript animal pool through selection (Khirari *et al.* 2014) [6].

Materials and Methods

In present study the data on morphological characteristics and productive characteristics were collected by actual interview with the Red Kandhari owners with the help of model questionnaire from Renapur, Deonandra, Babultar, Bandarwada and Kherdavillages from Pathri tahsil of Parbhani district. The data was collected from 50 cattle of different age groups *i.e.* upto 1 year, 1 to 2 year, 2 to 3 year and above 3 years age groups.

The data was categorized in the following age groups

Sr. No.	Age between (years)
1.	Up to 1 year
2.	1-2 year
3.	2-3 year
4.	3 year and above (Adult female)

Morphological characteristics

Variables like colour of coat, shape and size of horn, length and orientation of ear, forehead, body characteristics, body measurement, lactational milk yield, lactation period and milk yield per day were taken into consideration for identifying different groups of Red Kandhari cattle. The adopted procedure is described below.

1. Colour pattern

Colour of body coat, hoofs, muzzle, eyelids, horns and tail switch were observed in qualitative term i.e., Dark red / Brick red / Black sheds on neck, shoulder, thighs.

2. Shape, length and orientation of horn

The presence or absence of horns were observed. Shape of horn were observed in terms of straight or curved, horn orientation was observed i.e., whether outward or upward. Horn length was measured from the base of the horn to the tip of the horn.

3. Length and orientation of ear

The length of ear was measured from the base of the ear to the tip of the ear. The orientation of the ear includes, horizontal and drooping ears.

4. Shape of forehead

The shape of forehead was observed in terms of convex, concave and straight like shapes.

5. Body characteristics

The shape of the body was observed in terms of hump, dewlap and naval flap as large, medium and small type.

6. Udder characteristics

a. Shape of udder

Udder shape was observed as bowl, round, trough and pendulous type.

b. Shape of teat

Shape of teat was observed as cylindrical, funnel and pear type of teat shape.

c. Shape of milk vein

Shape of milk vein were observed as large, medium and small type shape.

Statistical method

a) The data collected in respect of all the parameters was tabulated and subjected to statistical evaluation by adopting the standard technique prescribed by Cochran (1967) ^[11].

b) Chi-square test: Testing of homogeneity for various physical characteristics was tested by r x c contingency as per Amble (1975) ^[12].

The chi-square values for each observation was calculated as per following formula.

$$\chi^2 = \sum \frac{(\text{Observed value} - \text{Expected value})^2}{\text{Expected value}}$$

Results and Discussion

Morphological characteristics

The frequency distribution of different morphological characters and other body measurement of Red Kandhari cattle are discussed below.

I. Colour pattern

The colour variations in Red Kandhari cattle were observed and recorded for coat, muzzle, hoof, eyelids, tail switch and horn in percent and presented in Table 1.

A. Coat colour

The colour pattern observed in Red Kandhari cattle in Pathri tehsil of Parbhani district exhibited dark red body colour, while remaining cattles were found to be brick red in colour and black sheds on neck, shoulder and thigh. Out of 200 Red Kandhari cattles, 49 cattles (24.5%) were having dark red coat colour and 142 cattles (71%) were found to be with brick red colour, 9 cattles (4.5%) black sheds on neck, shoulder and thigh. The chi-square value found to be 139.69, which is statistically significant, indicating variation among coat colour of animal. Similar result were found by Shinde (2013) ^[8] worked on the morphometric characters of Red Kandhari cattle in Nanded district of Maharashtra and observed that the brick red colour was predominant (52.73%) followed by dark red (43.46%) and black shades on neck, shoulder and thigh region (3.81%), respectively.

B. Muzzle colour

From table one it was revealed that, black and brown colour of muzzle were found in Red Kandhari cattle breed. Mostly the muzzle colour were found to be black (94%) and remaining cattles were having brown muzzle colour (6%). The chi-square test was applied and the chi-square value was found to be 154.88 which was statistically significant and indicates variation in muzzle colour. Similar results were reported by Chavhan *et al.* (2022) ^[3] observed that the muzzle colour was black in almost all the animals of Kathani cattle (94%). Ashwini Kunghadkar (2017) ^[1] observed the muzzle colour as black (92.2%) in Kathani cattle.

C. Hoof colour

The hoof colour in Red Kandhari cattle were found to be black and brown. Hoof colour were mostly found to be black (94.5%) and the remaining cattles were having brown hoof colour (5.5%). The chi-square values were found to be 158.42 which was statistically significant and indicates variation in hoof colour. The present results is in agreement with Chavhan *et al.* (2022) ^[3] observed that the hoof colour was found to be black (92.5%) in Kathani cattle. Ashwini Kunghadkar (2017) ^[1] observed the black hoof colour (95.5%) in Kathani cattle.

D. Eyelid colour

From the present study, it was seen from the Table 1 that most of the cattle having black eyelid colour and the remaining cattles were found with the brown eyelid colour. It was observed that 195 (97.5%) cattles were having the black colour eyelid and 5 (2.5%) of the cattles were having white colour of eyelid. The chi-square test was applied and the chi-square value was found to be 162.00, which was statistically significant and indicates variation in the eyelid colour. The present results is in agreement with Chavhan *et al.* (2022) ^[3] observed that the eyelid colour of Kathani colour was mostly found to be black (93.0%). Ashwini Kunghadkar (2017) ^[1] has observed that the eyelid colour of Kathani cattle was black (96.50%).

E. Tail switch colour

The result presented in Table 1 indicate that most of the Red Kandhari cattles were having black tail switch colour 176 (88%) and the remaining cattles were having brown tail switch 24 (12%). The chi-square test was applied and the chi-

square value was found to be 115.52, which was statistically significant and indicates variation in tail colour. The present study is in agreement with Chavhan *et al.* (2022) [3] observed that the tail switch colour was found to be black (91.5%). Ashwini Kunghadkar (2017) [1] observed that tail switch colour (90.5%) was mostly black in Kathani cattle.

F. Horn colour

From the above table it is indicated that the majority of the

Red Kandhari cattles were found to have black coloured horn 38 (76%) and the remaining were found with the grey coloured horn 12 (24%). The chi-square test was applied and the chi-square value was 13.52, which is statistically significant and indicates the variation in horn colour. Similar results reported by Chavhan *et al.* (2022) [3] observed that the horn colour of Kathani cattle was grey (74%). Ashwini Kunghadkar (2017) [1] observed the colour of horn was generally grey (76%) in Kathani cattle.

Table 1: Colour pattern of different morphological characteristics along with χ^2 values

Sr. No.	Characters	No. of observations	Percentage %	Chi-square (χ^2)	D.F.	Significance
A	Coat colour					
	Dark Red	49	24.5	139.69	2	*
	Brick Red	142	71			
	Black sheds on neck, shoulder and thigh	9	4.5			
B	Muzzle colour					
	Black	188	94	154.88	1	*
	Brown	12	6			
C	Hoof colour					
	Black	189	94.5	158.42	1	*
	Brown	11	5.5			
D	Eyelid colour					
	Black	195	97.5	162.00	1	*
	Brown	5	2.5			
E	Tail switch colour					
	Black	176	88	115.52	1	*
	Brown	24	12			
F	Horns colour					
	Blackish	38	76	13.52	1	*
	Grey	12	24			

*Significant at 5% level

II. Shape and orientation of horn, ear and forehead

The observations pertaining to the orientation of horn, ear and forehead were recorded and their percent values were calculated along with chi-square values and presented in Table 2.

A. Horn shape

The horn shape was observed in 50 cattles which includes the age group of adult females. The two types of horn shape were observed (curve like and straight shape) in Red Kandhari cattle. Most of the Red Kandhari cattles were having curve shape of horns. The data in the Table 2 indicated that most of the cattle (72%) had curve shape horns, while (28%) cattles had straight horns. The chi-square was applied and the chi-square value was found to be 9.68, which was found to be statistically significant, indicating variation between different shape of horn in Red Kandhari cattle. Were as Chavhan *et al.* (2022) [3] observed curve shaped horn in Kathani cattle (70%). And Ashwini Kunghadkar (2017) [1] observed that curved shape of horn (76%) in Kathani cattle.

B. Horn orientation

The orientation of horn was observed, in adult females Red Kandhari cattle. The two types of horn orientations were observed in Red Kandhari cattle. The majority of cattles were found to be with outward orientation of horn (82%) and the remaining were with the upward orientation of horns (18%). The chi-square test was applied and the chi-square value was found to be 20.48, which was statistically significant which indicated the variation in the orientation of horns in Red Kandhari cattle. Similar result was reported by Chavhan *et al.* (2022) [3] who observed the outward horn orientation (78%) in Kathani cattle. Ashwini Kunghadkar (2017) [1] also observed

that orientation of horn was outward (84%) and upward (16%) in Kathani cattle.

C. Ear orientation

From table 2 it is revealed that 184 (92%) cattle exhibited horizontal ear orientation while 16 (8%) cattles were found with drooping ears. The chi-square was applied and the chi-square value was found to be 141.12, which is statistically significant and indicates the variation in the orientation of ears in Red Kandhari cattle. The present results is in agreement with Chavhan *et al.* (2022) [3] also found the horizontal orientation of ear was highest 188 (94%) and drooping orientation was low 12 (6%) in Kathani cattle. Jain *et al.* (2018) [13] observed that the ear orientation was horizontal in Kaosali breed of cattle. Ashwini Kunghadkar (2017) [1] observed horizontal orientation of ear (93%) and drooping ear (7%) in Kathani cattle.

D. Forehead shape

Forehead shape was observed in 200 Red Kandhari cattle of all age groups. Shape of forehead was observed as straight, concave and convex in Red Kandhari cattle. The percent values calculated for straight forehead was (90%), concave (7%) and convex (3%) respectively. The chi-square test was applied and the chi-square value was found to be 289.49, which was statistically significant indicating the variations in the shape of forehead in Red Kandhari cattle. Similarly, Chavhan *et al.* (2022) [3] observed the shape of forehead as straight, concave and convex and the percentage were 85.5, 12.5 and 2 percent respectively in Kathani cattle. Ashwini Kunghadkar (2017) [1] observed 87.5 percent straight forehead shape in Kathani cattle.

Table 2: Shape and orientation of horn, ear and forehead characteristics along with χ^2 values of Kathani cattle

Sr. No.	Characters	No. of observations	Percentage %	Chi-square (χ^2)	D.F.	Significance
A	Horn shape					
	Curve	36	72	9.68	1	*
	Straight	14	28			
B	Horn orientation					
	Outward	41	82	20.48	1	*
	Upward	9	18			
C	Ear orientation					
	Horizontal	184	92	141.12	1	*
	Drooping	16	8			
D	Forehead shape					
	Straight	180	90	289.49	2	*
	Concave	14	7			
	Convex	6	3			

*Significant at 5% level

III. Body characteristics of hump, dewlap and naval flap

The observations on body characteristics pertaining to shape of hump, dewlap and naval flap were recorded in 100 female cattle of age group 2-3 years and above 3 years and their percent values were calculated along with the chi-square values and presented in Table 3.

A. Hump

On the basis of data collected the hump of Red Kandhari cattle was found as large, medium and small. Table 3 indicates that the percentage value was highest for medium sized hump (73%) followed by small sized hump (17%) and large sized hump (10%). The chi-square test was applied and the chi-square value was found to be 71.54, which was statistically significant indicating variation between the different hump of Red Kandhari cattle. Similar observation was reported by Chavhan *et al.* (2018) [14] who observed medium sized hump (76%) followed by small type hump (20%) and large size hump (4%) in Kathani cattle. Ashwini Kunghadkar (2017) [1] observed the hump as medium in size (75%) in Kathani cattle.

B. Dewlap

The dewlap of Red Kandhari cattle was observed as large, medium and small. The perusal of Table 3 indicates that the

percentage value was found highest for medium type dewlap (76%), followed by large sized dewlap (16%) and small sized dewlap (8%). The chi-square test was applied and the chi-square value was found to be 82.87, which is statistically significant and indicates the variation in the size of dewlap of Red Kandhari cattle. Similar results were found by Chavhan *et al.* (2022) [3] who observed (74%) medium type of dewlap and (22%) small sized dewlap. Ashwini Kunghadkar (2017) [1] observed the (73%) medium type dewlap and (23%) small type dewlap.

C. Naval flap

The observations on the naval flap of the Red Kandhari cattle were found to be of different sizes i.e. large, medium and small. The percentage values were found to be highest for small sized naval flap (69%) followed by medium sized naval flap (29%) and large size naval flap (2%) in Red Kandhari cattle. The chi-square test was applied and the chi-square value was found to be 68.18, which was statistically significant and indicates the variation in the size of naval flap. Chavhan (2022) [3] observed small sized naval flap (77%), followed by medium sized naval flap (21%). Ashwini Kunghadkar (2017) [1] observed the naval flap was small (74%) in Kathani cattle.

Table 3: Body characteristics of hump, dewlap and naval flap along with χ^2 values

Sr. No.	Characters	No. of observations	Percentage %	Chi-square (χ^2)	D.F.	Significance
A	Hump					
	Large	10	10	71.54	2	*
	Medium	73	73			
	Small	17	17			
B	Dewlap					
	Large	16	16	82.87	2	*
	Medium	76	76			
	Small	8	8			
C	Naval flap					
	Large	2	2	68.18	2	*
	Medium	29	29			
	Small	69	69			

*Significant at 5% level

IV. Udder characteristics

The observations on the udder characteristics pertaining to udder shape, teat shape and milk vein were recorded in 50 cattle which include age group of adult females along with lactating as well as dry Red Kandhari cows and their percent

values were calculated along with chi-square values and presented in Table 4.

A. Udder shape

Table 6 indicates the percentage value of bowl-shaped udder was found to be highest (76%) followed by round shaped

udder (12%), trough shaped udder (4%) and pendulous shaped udder (8%) in Red Kandhari cattle. The chi-square test was applied and the chi-square value was found to be 71.44, which was statistically significant, indicating the variations in different udder shapes of cattle. Similar result was recorded by Chavhan *et al.* (2022) [3] who observed bowl shaped udder (76%), round shape udder (14%), trough shape udder (8%) and pendulous shape udder (6%). Ashwini Kunghadkar (2017) [1] who observed bowl shape udder (82%), round shape udder (10%), trough shape udder (4%) and pendulous shape udder (4%) in Kathani cattle.

B. Teat shape

The observations on the teat shape were found to be cylindrical, funnel and pear. Values in Table 6 indicates the number of cattle and the percentage value of different shapes of teat among which the cylindrical shape of teats was found to be highest (72%), followed by funnel shaped teats (18%) and pear-shaped teat (10%) in Red Kandhari cattle. The chi-square test was applied and the chi-square value was found to be 34.13, which was statistically significant and indicates the

variation in the shape of teat. Similar result was recorded by Chavhan *et al.* (2022) [3] who observed the cylindrical shape udder (74%) followed by funnel shape udder (14%) and pear shape udder (12%) in Kathani cattle. Ashwini Kunghadkar (2017) [1] also observed the teat shaped as cylindrical (78%) in Kathani cattle.

C. Milk vein

The observations on the milk vein were made in the Table 6 which were found to be large, medium and small in size. Small milk vein was found to be highest (82%), medium was found to be (14%) and large were found to be (4%) in Red Kandhari cattle. The chi-square test was applied and the chi-square value was 53.88, which was statistically significant and indicates the variation in the size of milk vein. Similar result was reported by Chavhan *et al.* (2022) [3] observed the small milk vein (76%), medium milk vein (16%) and large milk vein (8%) in Kathani cattle and Ashwini Kunghadkar (2017) [1] who observed Kathani cows with small (16%) to medium (80%) milk vein.

Table 4: Shape of udder, teat shape and milk vein characteristics along with χ^2 values

Sr. No.	Characters	No. of observations	Percentage %	Chi-square (χ^2)	D.F.	Significance
A	Udder shape					
	Bowl	38	76	71.44	3	*
	Round	6	12			
	Trough	2	4			
	Pendulous	4	8			
B	Teat shape					
	Cylindrical	36	72	34.13	2	*
	Funnel	9	18			
	Pear	5	10			
C	Milk vein					
	Large	2	4	53.88	2	*
	Medium	7	14			
	Small	41	82			

*Significant at 5 % level

V. Length of horn and ear

A. Length of horn

From Table 5 it was observed that the average length of horn in adult cattle above 3 years of age was 18.84±0.45 cm. The present study is in agreement with the horn length recorded by Chavhan (2022) [3] in Kathani cattle which was 14.98±0.87 cm. length reported by Ashwini Kunghadkar (2017) [1] was 15.31±0.64 cm in Kathani cattle of Chamorshi tahsil of Gadchiroli district. Khirari *et al.* (2014) [6] reported that average horn length of non-descript cattle of Ratnagiri district was 18.06±0.63 cm.

Table 5: The mean value of horn length (cm)

Sr. No.	Age group (year)	No. of Animals	Horn Length (cm)		Average ± S.E.	SD
			Max	Min		
1	Above 3 years	50	25	10	18.84±0.45	3.55

B. Length of ear

The data revealed that the average length of ears in age group of up to 1 year, 1 to 2 year, 2 to 3 year and above 3 year were 16.15±0.28, 20.68±0.27, 21.37±0.35 and 23.06±0.42 cm, respectively. The length of ears increases with the increase in age. Chavhan *et al.* (2022) [3] reported more or less similar result in terms of ear length of cattle as 19.02±0.30 cm in Kathani cattle. Das *et al.* (2018) [4] recorded the ear length

25.07±0.30 cm in Red Kandhari cattle. Ashwini Kunghadkar (2017) [1] observed the length of ears as 18.96±0.33 cm in Kathani cattle. Khirari *et al.* (2014) [6] observed that the average ear length was 18.06±0.21 cm in non-descript cattle of Ratnagiri district.

Table 6: The mean value of ear length (cm)

Sr. No.	Age group (year)	No. of Animals	Ear Length (cm)		Average ± S.E.	SD
			Max	Min		
1	Up to 1 year	50	20	11	16.15±0.28	2.004
2	1 to 2 year	50	24	16	20.68±0.27	2.679
3	2 to 3 year	50	26	17	21.37±0.35	2.54
4	Above 3 year	50	28	18	23.06±0.42	3.009

VI. Productive characteristics

A. Lactational milk yield

The data presented in Table 7 revealed that the average lactational milk yield of 50 adult female Red Kandhari cattle was observed to be 534.7±6.97 kg. The Present study is in agreement with Chavhan *et al.* (2022) [3] in Kathani cattle was 520.61±21.59 kg. Wagh *et al.* (2019) [10] recorded that the lactation milk yield of Gaolao cattle was 520.79±6.20 kg. Janmeda *et al.* (2013) [5] recorded that the average total lactation milk yield of Dangi cow was 529.5±17.7 kg.

Table 7: The mean value of lactational milk yield of Red Kandhari cattle (kg)

Sr. No.	Age group (year)	No. of Animals	Lactational Milk yield (kg)		Average \pm S.E.	SD
			Max	Min		
1	Above 3 years	50	600	420	534.7 \pm 6.97	49.31

B. Lactation period

Lactational milk yield is important trait for selection purpose. From Table 8 it is recorded that the average lactation period of 50 adult female Red Kandhari cattle was found to be 252.68 \pm 1.52 days. The present study is in agreement with that of Bainwad *et al.* (2019) [2] recorded lactation period was 242.64 \pm 0.46 days in Red Kandhari cattle. Wagh *et al.* (2019) [10] recorded that the lactation period of Gaolao cattle was 254.51 \pm 1.17days.

Table 8: The mean value of lactation period of Red Kandhari cattle (days)

Sr. No.	Age group (year)	No. of Animals	Lactation Period (days)		Average \pm S.E.	SD
			Max	Min		
1	Above 3 years	50	280	240	252.68 \pm 1.52	10.75

C. Milk yield per day

From the Table 9 it is found that the average daily milk yield per day of Red Kandhari cattle belonging to age group above 3 years was 2.74 \pm 0.08 kg. The present study is in the close agreement to that of Bainwad *et al.* (2019) [2] recorded milk yield 2.63 \pm 0.01 kg in Red Kandhari cattle, Chavhan *et al.* (2022) [3] who recorded that the milk yield per day in Kathani cattle was 2.95 \pm 0.17 kg.

Table 9: The mean value of milk yield per day of Red Kandhari cattle (kg)

Sr. No.	Age group (year)	No. of Animals	Milk Yield Per Day (kg)		Average \pm S.E.	SD
			Max	Min		
1	Above 3 years	50	3.5	1.5	2.74 \pm 0.08	0.60

Conclusion

The milk production performance of Red Kandhari cattle is fair, hence, it can be considered as the draught breed of cattle having higher biological potential for improvement in production. This study will be helpful for selection of promising animal for genetic improvement, for conservation of this breed and to enhance the milk production. By assessment of these characters, this work will be useful for the breeders for recognition of breed in the region.

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