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Studies on Reproductive Performance of Red Kandhari Cattle in their Breeding Tract of Maharashtra, India

D. V. Bainwad*, B. M. Thombre and S. G. Narwade

Department of Animal Husbandry and Dairy Science, Vasantrao Naik Marathwada Krishi Vidyapeeth, College of Agriculture, Parbhani- 431 402, India

**Corresponding author*

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A B S T R A C T

Red Kandhari is one of the important breed of Marathwada region of Maharashtra State. This breed is known as Lal Kandhari. In the present investigation the reproductive performance of Red Kandhari cattle at various stages of growth were studied at different locations in the breeding tract. The idea behind the collection of data in breeding tract of Red Kandhari cattle from the farmers and breeders herd of Red Kandhari rather than on the organized farm to obtain the real picture of reproductive performance of breed in the breeding tract. The reproductive traits often help in judging the economic value of the animal. The overall least square means for age at puberty (AP) of Red Kandhari cattle was recorded as 883.16 ± 0.83 days. The effect of block and season were found highly significant on AP whereas, the effect of colour was found non-significant. The overall least square means for age at first estrus (AFE) of Red Kandhari cattle was recorded as 1236.96 ± 1.67 days. The effect of block and season were found highly significant on AFE whereas, the effect of colour was found non-significant. The overall least square means for age at first calving (AFC) of Red Kandhari cattle was recorded as 1529.61 ± 1.71 days. The effect of season was found highly significant on AFC whereas, the effect of block and colour were found non-significant. The overall least square means for service period (SP) of Red Kandhari cattle was recorded as 139.92 ± 0.66 days. The effect of block and season were found highly significant on SP whereas, the effect of colour was found non-significant. The overall least square means for gestation period (GP) of Red Kandhari cattle was recorded as 283.49 ± 0.23 days. The effect of block, season and colour were found non-significant on GP. The improvement in reproductive characteristics of indigenous breeds has become essential to make the economically viable dairy animals.

Introduction

Dairying has become an important secondary source of income for millions of rural families and has assumed the most important role in providing employment and income generating opportunities particularly for marginal and women farmers. The livestock sector alone contributes nearly 25.6% of value of output at current prices of total value of output in Agriculture, Fishing and Forestry sector. The overall contribution of livestock sector in total GDP is nearly 4.11% at current prices during 2012-13. India has 190.9 million cattle, 108.7

million buffaloes, 135.2 million goats and 65.06 million sheep population. The total Bovine population is 299.9 million in 2012 which shows a decline of 1.57% over previous census (Livestock Census, 2012). Red Kandhari is one of the important breed of Marathwada region of Maharashtra State. The Red Kandhari germplasm has very old and rich historical background. It is said that the breeding of cattle was taken up by the Royal dynasty of king Somadeorai as far back as fourth century A. D. The cattle breed having red colour naturally acquires the name as Red Kandhari as it is sure that the breed would have been named by Raja Somadeorai in memory of his father as Raja Kanhar now misnomered as Red Kandhari (Chauhan *et al.*, 2008). The reproductive characteristics like reproductive characteristics like AP, AFE, AFC, SP, GP and ICP were taken into consideration for present study. The Red Kandhari breed is reared mainly for draught purpose. Animals are medium in size, strong, compact and good looking. Body colour is dull red to almost dark brown. Cows are low milk producers and bullocks of the breed are preferred over the Deoni breed for better draught ability and smaller size (Pundir and Singh, 2008). Therefore, the present study has been conducted to study the reproductive characteristics, colour pattern effect on various characteristics, effect of season on lactation milk yield and block effect on various characteristics.

Materials and Methods

Selection of Cattle

The data on reproductive traits of 597 Red Kandhari cattle was collected by actual interview with the livestock owners with the help of model questionnaire at different villages as mentioned below. From each tehsils on an average 66 cattle / individuals was chosen randomly for present study. The data on reproductive characteristics i.e. AP, AFE, AFC, SP, GP and ICP was collected by actual interview with the livestock owners with the help of model questionnaire. The collected data was classified as per colour pattern (*viz*., Dark Red, Brick Red followed by Black Shades on NST i.e. Neck, Shoulder and Thigh) and as per seasons as S_1 - Pre-monsoon (March - May), S_2 - Monsoon (June - September), S_3 - Post-monsoon (October - November) and S_4 - Summer (December - February). The data on productive traits were collected from different districts of Marathwada region as mentioned in Table 1.

Reproductive characteristics

The analysis of data will be done by method of Least Square Technique as outlined by Harvey (1990). The following mathematical model will be employed to analyze the data.

$$Y_{ijklm} = \mu + B_i + C_j + S_k + O_l + e_{ijklm}$$

Where,

Y_{ijklm} = is the record of m^{th} Red Kandhari individual in i^{th} block, j^{th} colour, k^{th} season and l^{th} off-type.

μ = is the population mean common to all the observations.

B_i = is the effect of i^{th} block of individual.
C_j = is the effect of $_j^{th}$ colour of individual.
S_k = is the effect of $_k^{th}$ season of individual.
O_l = is the effect of $_l^{th}$ off-type of individual.

e_{ijklm} = is the random error assumed to be NID $(0, \delta^2,e)$

The significant effect will be further analyzed to have all pair wise comparison by Duncan's Multiple Range Test (DMRT) as modified by Kramar (1957).

Results and Discussion

Reproductive characteristics

Age at puberty (AP)

It was observed from Table 2 that the overall least square means for AP of Red Kandhari cattle was recorded as 883.16 ± 0.83 days. Higher days AP was reported by Vedpathak *et al.,* (2006) as 1280.50 ± 0.73 days in Red Kandhari cattle and Azizunnesa *et al.,* (2010) as 2.68 ± 1.71 years in Red Chittagong cattle, respectively.

Block effect on AP

The difference observed in the LSMs for AP of Red Kandhari cattle was highly significant due to block effect. The LSM for AP of Red Kandhari cattle in block D_1, D_2, D_3, D_4, and D_5 were 885.63 ± 1.35, 878.82 ± 1.38, 878.04 ± 1.26, 886.53 ± 1.54 and 886.78 ± 2.43 days, respectively. The DMRT revealed that Red Kandhari cattle maintained at D_5 block had highly significant higher AP over other blocks.

Colour pattern effect on AP

The differences observed in the LSMs for AP of Red Kandhari cattle were non-significant due to colour pattern effect. The LSM for AP of Red Kandhari cattle for colour pattern C_1 and C_2 were 883.04 ± 1.01 and 883.28 ± 1.08 days, respectively.

Season effect on Age at puberty

The differences observed in the LSMs for AP of Red Kandhari cattle were highly significant due to season effect. The LSM for AP of Red Kandhari cattle for season S_1, S_2, S_3 and S_4 were 878.48 ± 2.01, 891.97 ± 1.89, 883.81 ± 1.09 and 878.37 ± 1.03 days, respectively. The DMRT revealed that Red Kandhari cattle maintained in S_2 season had highly significant higher AP over other seasons.

Age at first estrus (AFE)

It was observed from Table 3 that the overall least square means for AFE of Red Kandhari cattle was recorded as 1236.96 ± 1.67 days. Higher days AFE was reported by Kulkarni *et al.,* (2013) as 41.70 ± 0.20 months in Kathani cattle of Vidarbha region of Maharashtra and lower days AFE was reported by Singh *et al.,* (2002) as 35.60 ± 0.53 months in Deoni cattle.

Block effect on Age at first estrus

The difference observed in the LSMs for AFE of Red Kandhari cattle was highly significant due to block effect. The LSM for AFE of Red Kandhari cattle in block D_1, D_2, D_3, D_4, and D_5 were 1238.51 ± 2.72, 1238.61 ± 2.77, 1244.58 ± 2.53, 1235.41 ± 3.09 and 1227.71 ± 4.89 days, respectively. The DMRT revealed that Red Kandhari cattle maintained at D_3 block had highly significant higher AFE over other blocks.

Colour pattern effect on Age at first estrus

The differences observed in the LSMs for AFE of Red Kandhari cattle were non-significant due to colour pattern effect. The LSM for AFE of Red Kandhari cattle for colour pattern C_1 and C_2 were 1237.69 ± 2.03 and 1236.24 ± 2.16 days, respectively.

Season effect on Age at first estrus

The differences observed in the LSMs for AFE of Red Kandhari cattle were highly significant due to season effect. The LSM for AFE of Red Kandhari cattle for season S_1, S_2, S_3 and S_4 were 1256.59 ± 4.04, 1243.33 ± 3.80, 1210.19 ± 2.19 and 1237.75 ± 2.08 days, respectively. The DMRT revealed that

Red Kandhari cattle maintained in S_1 season had highly significant higher AFE over other seasons.

Age at first calving (AFC)

It was observed from Table 4 that the overall least square means for AFC of Red Kandhari cattle was recorded as 1529.61 ± 1.71 days. Higher days age at first calving was reported by Gokhale (2013) as 52.93 ± 0.23 months in Dangi cattle, Kulkarni *et al.,* (2013) as 53.53 ± 0.20 months in Kathani cattle of Vidarbha region in Maharashtra and Bhutkar (2014) as 1659.15 35.77 days in Deoni cattle at CCBP, Parbahni, respectively and lower days AFC was reported by Pundir and Singh (2008) as 39.47 months in Red Kandhari cattle.

Block effect on AFC

The difference observed in the LSMs for AFC of Red Kandhari cattle was non- significant due to block effect. The LSM for AFC of Red Kandhari cattle in block D_1, D_2, D_3, D_4, and D_5 were 1533.43 ± 2.77, 1530.72 ± 2.82, 1528.31 ± 2.58, 1531.56 ± 3.16 and 1524.06 ± 4.98 days, respectively.

Colour pattern effect on AFC

The differences observed in the LSMs for AFC of Red Kandhari cattle were non-significant due to colour pattern effect. The LSM for AFC of Red Kandhari cattle for colour pattern C_1 and C_2 were 1528.86 ± 2.07 and 1530.37 ± 2.20 days, respectively.

Season effect on AFC

The differences observed in the LSMs for AFC of Red Kandhari cattle were highly significant due to season effect. The LSM for AFC of Red Kandhari cattle for season S_1, S_2, S_3 and S_4 were 1525.78 ± 4.12, 1553.08 ± 3.88, 1510.28 ± 2.23 and 1529.32 ± 2.12 days, respectively. The DMRT revealed that Red Kandhari cattle maintained in S_2 season had highly significant higher AFC over other seasons.

Table.1 List of villages randomly selected for collection of data

Sr. No.	Name of the District	Name of the Tehsils	Name of the Villages
1.	Nanded (D_1)	Kandhar	Bori (Khu.), Umaraj, Jambhulwadi, Dagadsangavi, Ghodaj
		Loha	Dhanora (Makta), Subhashnagar, Chitali, Malakoli, Malegaon
2.	Latur (D_2)	Ahmedpur	Sangavi (Su.), Sunegaon (Sa.), Babaldara, Hippalgaon, Sawargaon (Thot)
		Jalkot	Kunki, Wanjarwada, Hawarga, Jirga, Jagalpur
3.	Parbhani (D_3)	Palam	Kerwadi, Shirpur, Sayal, Kapsi, Pethshivani
		Gangakhed	Dhavalkewadi, Kaudgaon, Malewadi, Maradasgaon, Naralad
4.	Hingoli (D_4)	Vasmat	Aaral, Darephal, Bori, Aadgaon, Kalamba
		Aundha	Barashiv, Ranjala, Purjal, Sirla, Aajarsonda
5.	Beed (D_5)	Parli	Tokwadi, Sangam, Waghbet, Belamba, Injegaon

Table.2 Least squares means for AP as affected by block and colour pattern in Red Kandhari cows

Sources	Code	N	Mean AP(Days) ± SE
Population mean	μ	597	883.16 ± 0.83
District			
Nanded	D_1	149	885.63^{a} ± 1.35
Latur	D_2	138	878.82^{b} ± 1.38
Parbhani	D_3	164	878.04^{b} ± 1.26
Hingoli	D_4	106	886.53^{c} ± 1.54
Beed	D_5	40	886.78^{c} ± 2.43
Colour			
Dark Red	C_1	336	883.04 ± 1.01
Brick Red	C_2	261	883.28 ± 1.08
Season			
Pre-monsoon	S_1	58	878.48^{a} ± 2.01
Monsoon	S_2	67	891.97^{b} ± 1.89
Post-monsoon	S_3	231	883.81^{bc} ± 1.09
Summer	S_4	241	878.37^{c} ± 1.03

Note: Means connected by same superscripts do not differ significantly

Table.3 Least squares means for AFE as affected by block and colour pattern in Red Kandhari cows

Sources	Code	N	Mean AFE (Days) ± SE
Population mean	μ	597	1236.96 ± 1.67
District			
Nanded	D_1	149	1238.51^{a} ± 2.72
Latur	D_2	138	1238.61^{a} ± 2.77
Parbhani	D_3	164	1244.58a ± 2.53
Hingoli	D_4	106	1235.41^{b} ± 3.09
Beed	D_5	40	1227.71^{b} ± 4.89
Colour			
Dark Red	C_1	336	1237.69 ± 2.03
Brick Red	C_2	261	1236.24 ± 2.16
Season			
Pre-monsoon	S_1	58	1256.59^{a} ± 4.04
Monsoon	S_2	67	1243.33^{b} ± 3.80
Post-monsoon	S_3	231	1210.19^{bc} ± 2.19
Summer	S_4	241	1237.75^{b} ± 2.08

Note: Means connected by same superscripts do not differ significantly

Table.4 Least squares means for AFC as affected by block and colour pattern in Red Kandhari cows

Sources	Code	N	Mean AFC (Days) ± SE
Population mean	μ	597	1529.61 ± 1.71
District			
Nanded	D_1	149	1533.43 ± 2.77
Latur	D_2	138	1530.72 ± 2.82
Parbhani	D_3	164	1528.31 ± 2.58
Hingoli	D_4	106	1531.56 ± 3.16
Beed	D_5	40	1524.06 ± 4.98
Colour			
Dark Red	C_1	336	1528.86 ± 2.07
Brick Red	C_2	261	1530.37 ± 2.20
Season			
Pre-monsoon	S_1	58	1525.78^{a} ± 4.12
Monsoon	S_2	67	1553.08^{b} ± 3.88
Post-monsoon	S_3	231	1510.28^{bc} ± 2.23
Summer	S_4	241	1529.32^{c} ± 2.12

Note: Means connected by same superscripts do not differ significantly

Table.5 Least squares means for SP as affected by block and colour pattern in Red Kandhari cows

Sources	Code	N	Mean SP (Days) ± SE
Population mean	μ	597	139.92 ± 0.66
District			
Nanded	D_1	149	132.90^{a} ± 1.07
Latur	D_2	138	140.22^{b} ± 1.10
Parbhani	D_3	164	145.69^{bc} ± 1.00
Hingoli	D_4	106	145.20^{bc} ± 1.22
Beed	D_5	40	135.59^{bd} ± 1.93
Colour			
Dark Red	C_1	336	139.72 ± 0.80
Brick Red	C_2	261	140.13 ± 0.85
Season			
Pre-monsoon	S_1	58	140.60^{a} ± 1.60
Monsoon	S_2	67	145.93^{b} ± 1.51
Post-monsoon	S_3	231	139.92^{a} ± 0.87
Summer	S_4	241	133.23^{bc} ± 0.82

Note: Means connected by same superscripts do not differ significantly

Table.6 Least squares means for GP as affected by block and colour pattern in Red Kandhari cows

Sources	Code	N	Mean GP (Days) ± SE
Population mean	μ	597	283.49 ± 0.23
District			
Nanded	D_1	149	283.88 ± 0.38
Latur	D_2	138	283.98 ± 0.39
Parbhani	D_3	164	283.25 ± 0.35
Hingoli	D_4	106	282.93 ± 0.43
Beed	D_5	40	283.42 ± 0.68
Colour			
Dark Red	C_1	336	283.60 ± 0.28
Brick Red	C_2	261	283.39 ± 0.30
Season			
Pre-monsoon	S_1	58	285.04 ± 0.57
Monsoon	S_2	67	280.01 ± 0.53
Post-monsoon	S_3	231	283.07 ± 0.31
Summer	S_4	241	285.86 ± 0.29

Note: Means connected by same superscripts do not differ significantly

Service period (SP)

It was observed from Table 5 that the overall least square means for SP of Red Kandhari cattle was recorded as 139.92 ± 0.66 days. Higher days service period was reported by Dhumal *et al.*, (1989) as 164.72 days and Atharkar (1990) as175.99 ±18.03 days in Red Kandhari cattle, respectively and lower days age at first calving was reported by Joshi *et al.*, (2005) as 127.50±2.03 days in Tharparkar cattle.

Block effect on SP

The difference observed in the LSMs for SP of Red Kandhari cattle was highly significant due to block effect. The LSM for SP of Red Kandhari cattle in block D_1, D_2, D_3, D_4, and D_5 were 132.90 ± 1.07, 140.22 ± 1.10, 145.69 ± 1.00, 145.20 ± 1.22 and 135.59 ± 1.93 days, respectively. The DMRT revealed that Red Kandhari cattle maintained at D_3 block had highly significant higher SP over other blocks.

Colour pattern effect on SP

The differences observed in the LSMs for SP of Red Kandhari cattle were non-significant due to colour pattern effect. The LSM for SP of Red Kandhari cattle for colour pattern C_1 and C_2 were 139.72 ± 0.80 and 140.13 ± 0.85 days, respectively.

Season effect on SP

The differences observed in the LSMs for SP of Red Kandhari cattle were highly significant due to season effect. The LSM for SP of Red Kandhari cattle for season S_1, S_2, S_3 and S_4 were 140.60 ± 1.60, 145.93 ± 1.51, 139.92 ± 0.87 and 133.23 ± 0.82 days, respectively. The DMRT revealed that Red Kandhari cattle maintained in S_2 season had highly significant higher SP over other seasons.

Gestation period (GP)

It was observed from Table 6 that the overall least square means for GP of Red Kandhari

cattle was recorded as 283.49 ± 0.23 days in the present study which is in agreement with Ghafoor *et al.,* (1980) as 280.44 days and Shelke *et al.,* (1992) as 282.20 days, in Red Kandhari cattle, respectively.

Block effect on GP

The difference observed in the LSMs for GP of Red Kandhari cattle was non- significant due to block effect. The LSM for GP of Red Kandhari cattle in block D_1, D_2, D_3, D_4, and D_5 were 283.88 ± 0.38, 283.98 ± 0.39, 283.25 ± 0.35, 282.93 ± 0.43 and 283.42 ± 0.68 days, respectively.

Colour pattern effect on GP

The differences observed in the LSMs for GP of Red Kandhari cattle were non-significant due to colour pattern effect. The LSM for GP of Red Kandhari cattle for colour pattern C_1 and C_2 were 283.60 ± 0.28 and 283.39 ± 0.30 days, respectively.

Season effect on GP

The differences observed in the LSMs for GP of Red Kandhari cattle were non- significant due to season effect. The LSM for GP of Red Kandhari cattle for season S_1, S_2, S_3 and S_4 were 285.04 ± 0.57, 280.01 ± 0.53, 283.07 ± 0.31 and 285.86 ± 0.29 days, respectively.

In conclusion the effect of block and season were found highly significant on AP and SP. Hence it is concluded that the management practices, available water and feed resources and climatic condition followed there plays an important role on reproductive performance of Red Kandhari cattle.

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