Original Research

Morphometric Characteristics of Udder and Teats in Crossbred Cows

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Abstract

The crossbred cows (n=200) from 13 different dairy farms located in Anand district of Gujarat state were utilized for this study. In crossbred cows, the frequencies of trough (bowl), round, goaty and pendulous shaped udder were 56.5 %, 19.5 %, 7.5 % and 16.5 %, respectively. Similarly, the frequencies of cylindrical, funnel, bottle and pear shaped teats were 24.75 %, 48.63 %, 22.13 % and 4.5 %, respectively. The mean udder length, width and depth ranged from 50.87 ± 2.57 cm in goaty udders to 64.86 ± 1.89 cm in pendulous udders, 57.94 ± 2.31 cm in goaty udders to 73.02 ± 2.05 cm in pendulous udders and 20.43 ± 0.92 cm in goaty udders to 27.18 ± 1.01 cm in pendulous udders, respectively. The mean teat length ranged from 5.21 ± 0.27 cm in pear shaped teat to 5.96 ± 0.12 cm in bottle shaped teat. The mean teat diameter ranged from 2.04 ± 0.08 cm in pear shaped teat to 2.86 ± 0.06 cm in bottle shaped teat.

Key words: Crossbred Cows, Depth, Udder, Length, Teat, Width

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Introduction

Physical characteristics of udder and teats are important traits associated with incidences of sub-clinical mastitis (Sabin George *et al.*, 2007). Udder is the first site judgement of local brokers or animal husbandry men in our country for judging the milking ability of animals. So it is more important to have knowledge of morphometry of udder and teats. Kshatriya *et al*. (2009) studied the association of udder and skin thickness with milk yield in Kankrej and crossbred cows and found that the mean of udder length, width and depth in crossbred cows were 20.73 ± 0.89, 23.31 ± 0.85 and 8.00 ± 0.34 inches, respectively. Deng *et al.* (2012) reported that the mean udder length, udder depth, fore teat length and rear teat length were 44.8 cm, 23.7 cm, 6.78 cm and 5.99 cm, respectively in Kenana × Friesian crossbred cows. Hussain *et al.* (2012) reported that the mean length and diameter for fore teats were 4.77 ± 0.51 cm

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and 1.68 ± 0.13 cm and while for rear teats 4.66 ± 0.54 cm and 1.70 ± 0.08 cm, respectively in cows. Singhai *et al.* (2013) reported that the mean udder length, width and depth in Gir cows were 45.99 ± 2.07 cm, 20.51 ± 0.99 cm and 20.29 ± 1.04 cm while mean teat length and teat diameter were 7.07 ± 0.42 and 3.49 ± 0.21 cm, respectively. Deng *et al.* (2012) studied the effect of parity on udder and teat measurements in Kenana × Friesian crossbred cows and reported that the mean udder length, fore udder depth and hind depth increased from 42.8 cm to 52.3 cm, 21.7 to 25.0 cm, 21.5 to 22.5 cm, respectively from first parity to eighth parity while fore teat and rear length increased from 6.67 to 7.50 cm and 6.009 to 6.50 cm, respectively from first parity to eighth parity. The udder and teat measurements differ significantly ($P<0.05$) by parity orders. Singhai *et al.* (2013) reported that the udder length increased from 40.92 ± 1.36 to 51.71 ± 1.73 cm, udder width from 19.02 ± 0.76 to 21.90 ± 0.89 cm and udder depth from 17.86 ± 0.77 to 24.03 ± 0.82 cm, in Gir cows from first parity to fourth parity and above. The mean teat length increased from 6.23 ± 0.30 to 8.27 ± 0.39 cm and teat diameter from 3.09 ± 0.15 to 3.90 ± 0.14 cm from first parity to fourth parity and above. The measurements of udder length, width and depth and teat length and diameters differed highly significantly ($P<0.01$) with increased parity of cows.

Gajbhiye *et al.* (2007) observed various shapes of udder in crossbred cows and reported that the globular, trough and pendulous shape udders were 53.64 %, 37.69 % and 2.58 %, respectively. Kamboj *et al.* (2007) studied the effect of udder and teat shapes and their measurements on somatic cell counts in milk of Karan fries cows and found that the cows with trough shape udder were most frequent (45.94%), followed by pendulous (19.47%), goaty (15.09%), round (11.94%) and unbalanced udders (7.51%). The conical or funnel shaped teats were most frequent (48.27%), followed by cylindrical (37.42%) and bottle shaped teats (14.31%). Prasad *et al.* (2010) observed various udder measurements in Murrah buffaloes and reported mean udder length (cm) for bowl, globular, goaty and pendulous shaped udders as 54.7 ± 0.37, 53.8 ± 0.10, 51.5 ± 0.91, and 53.9 ± 1.15, respectively. Mean udder width (cm) for bowl, globular, goaty and pendulous shaped udders was 51.± 0.48, 50.7 ± 0.90, 46.1 ± 0.51 and 51.5 ± 0.73, respectively. Mean udder depth (cm) for bowl globular, goaty and pendulous shaped udder 15.7 ± 0.11, 15.7 ± 0.28, 14.8 ± 0.34, and 15.5 ± 0.27, respectively.

Materials and Methods

The crossbred cows (n=200) from 13 different dairy farms located in Anand district were utilized for this study. All the udder measurements i.e. length, width and depth were recorded before the commencement of milking in the afternoon. Shape of udder was determined through visual appraisal method adopted by Cerkascenko (1958) and accordingly categorized into different types, viz., trough, round, goaty and pendulous. The teat measurements i.e. length and diameter in both fore and rear teats and shape of teats

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were observed grossly and categorized in to different types, viz. cylindrical, funnel, bottle and pear shaped teats as per the visual appraisal method followed by Ovesen (1972).

Statistical Analysis

Statistical analysis was done using standard procedures as per Snedecor and Cochran (1994).

Shape of Udder

Trough

Round

Goaty

Pendulous

Shape of Teats

Cylindrical

Funnel

Bottle

Pear

Results and Discussion

A visual appraisal was made to evaluate the shapes of udder and teats. The udder shapes were classified into Trough, Round, Goaty and Pendulous types whereas teat shapes were grouped as Cylindrical, Funnel, Bottle and Pear types. The observed frequencies of various udder and teat shapes in experimental cows are presented in Table 1.

Table 1: Frequency of different udder and teat shapes in crossbred cows

Udder Shape	Frequency	%	Teat Shape	Frequency	%
Trough (Bowl)	113	56.5	Cylindrical	198	24.75
Round	39	19.5	Funnel (Conical)	389	48.63
Goaty	15	7.5	Bottle	177	22.13
Pendulous	33	16.5	Pear	36	4.5
Total	**200**	**100**	**Total**	**800**	**100**

The frequencies of trough (bowl), round, goaty and pendulous type udders were 56.5 %, 19.5 %, 7.5 % and 16.5 %, respectively. Thus, the trough type udders were found in more than half of the experimental cows. Similarly, Sharma (1967) reported highest frequency of trough (bowl) shaped udder in 93.00 %

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Hariana cows and 70.9 % Tharparkar cows. Tripathi *et al.* (1982) also found 59.6 % udder as bowl shaped in Gir cows. Present finding was in agreement with Saiyed (1987) who reported that the bowl shaped udder were the most common (77.42 %) followed by round (20.97 %) udder in Jersey × Kankrej F1 cows. In agreement, Kamboj *et al.* (2007) found trough shape udder as most frequent udder (45.94 %) in Karan Fries cows.

In the present study, round shape udders was observed in 19.5 % of experimental cows. Similar finding was reported in Tharparkar cows (20.9 %) by Sharma (1967). Sharma *et al.* (1983) also observed maximum udders of bowl shape in Hariana (92.2 %) and Tharparkar (93.00 %) cows. In Kankrej cows 49.56 % udders were bowl shaped (Prajapati *et al.,* 1995). Contrary to the present study, Singh *et al.* (1997) and Gajbhiye *et al.* (2007) reported highest proportion of round shape udder (72.00 % and 59.64 %, respectively) in crossbred cows. The frequency of goaty udder was found least (7.5 %) in the present study. Similar results have been reported for Tharparkar cows (8.1 %), Hariana cows (5.2 %), Gir cows (6.19 %) and Murrah buffaloes (9 %) by various workers (Sharma, 1967; Sharma *et al.,* 1983; Prajapati *et al.,* 1995 and Prasad *et al.,* 2010). On the contrary goaty udder as high as 15.09 % has been reported in Karan Fries cows by Kamboj *et al.* (2007). In the present study, proportion of pendulous udder was found to be 16.5 %. Singh *et al.* (1997) found pendulous udder in 9.4 % of Friesian × Hariana cows. Similarly, Prasad *et al.* (2010) observed pendulous udder in 13 % of Murrah buffaloes. However, negligible frequencies of pendulous udder have been reported in Kankrej (0.89%) and crossbred cows (3%) by Prajapati *et al.* (1995) and Singh *et al.* (1997), respectively. The frequencies of cylindrical, funnel, bottle and pear shaped teats were 24.75 %, 48.63 %, 22.13 % and 4.5 %, respectively. Thus, the funnel type teats were found maximum in experimental cows followed by cylindrical (24.75 %) and bottle (22.13%) shaped teats. Very few cows (4.5 %) had pear shaped teats. Present finding was in agreement with the finding of Bhosrekar and Nagpaul (1971) who reported that the conical (funnel) shaped teats were the most common (78.18 %) in Karan Swiss cows. Contrary to the present finding, Sonwane *et al.* (2002) found cylindrical teats as the most common teats (51.61 %) in crossbred cows. In Karan Swiss cows, similar trend was observed with highest frequency of conical or funnel shaped teats (48.27 %) followed by cylindrical (37.42 %) and bottle (14.31 %) shaped teats (Kamboj *et al.,* 2007).

The frequency of pear shaped teats was found least (4.5 %) in the present study. Similar result has been reported for Brown Swiss crossbred cows (2.15 %) by Singh and Bhatnagar (1977). However, pear shaped teat as high as 35.48 % has been reported in crossbred cows by Sonwane *et al.* (2002). The mean values of udders length, width and depth ranged from 50.87 ± 2.57 cm in goaty udders to 64.86 ± 1.89 cm in pendulous udders, 57.94 ± 2.31 cm in goaty udders to 73.02 ± 2.05 cm in pendulous udders and 20.43 ± 0.92 cm in goaty udders to 27.18 ± 1.01 cm in pendulous udders, respectively. The differences observed in mean udder length, width and depth due to different shapes of udder were statistically highly

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significant (P<0.01). Present finding corroborate the results of Ghosh and Prasad (1998) in Jersey × Red Sindhi cows in which highest udder measurements were found in pendulous udder and lowest in goaty udders. The udder measurements in crossbred cows were lowest in goaty shaped udder and highest in pendulous udders. Similar finding with regard to udder width has been reported by Prasad *et al.*(2010) in Murrah buffaloes. Overall mean udder length, width and depth were found to be 58.24 ± 0.68 cm, 65.45 ±0.70 cm and 23.06 ± 0.34 cm, respectively. It was found that all udder dimensions were highest in pendulous udders followed by round, trough (bowl) and goaty udders (Table 2).

Table 2: Mean udder length, width and depth (cm) in different shaped udder in Crossbred cows

Udder Shape	Udder Length		Udder Width		Udder Depth	
	Mean ± S. E.	C. V. %	Mean ± S. E.	C. V. %	Mean ± S. E.	C. V. %
Trough/Bowl(113)	56.52^{b}± 0.78	14.68	63.40^{b}± 0.79	13.32	21.91^{ab}± 0.40	19.54
Round (39)	60.46^{bc}± 1.37	14.21	67.85^{b}± 1.31	12.10	23.91^{b}± 0.57	14.86
Goaty (15)	50.87^{a}± 2.57	19.56	57.94^{a}± 2.31	15.44	20.43^{a}± 0.92	17.41
Pendulous (33)	64.86^{c}± 1.89	16.72	73.02^{c}± 2.05	16.15	27.18^{c}± 1.01	21.32
Overall (200)	**58.24 ± 0.68**	**16.54**	**65.45 ± 0.70**	**15.15**	**23.06 ± 0.34**	**20.90**

Means with different superscripts in columns differ significantly (P< 0.01)

The frequency of trough shaped udder was maximum in first to fourth parity cows. Pendulous shaped udder showed an increasing trend with advancement in parity being lowest (7.69 %) in first parity and highest (34.61 %) in fifth and above parity. Highest frequency (17.31 %) of goaty udder was found in first parity but then after the cows with goaty udder were less in number as the parity advanced. Similar observations have been reported in Kankrej cows by Prajapati *et al.* (1995). No clear cut trend was observed regarding round shaped udder (Table 3).

Table 3: Parity-wise distribution of udder shape in crossbred cows (n=200)

Parity	T	%	R	%	G	%	P	%	Total
1	24	46.15	15	28.85	9	17.31	4	7.69	52
2	31	77.50	4	10.00	0	0.00	5	12.5	40
3	28	62.22	7	15.56	4	8.89	6	13.33	45
4	22	59.46	5	13.51	1	2.70	9	24.32	37
≥5	8	30.77	8	30.77	1	3.85	9	34.61	26
Total	**113**	**56.50**	**39**	**19.50**	**15**	**7.5**	**33**	**16.5**	**200**

T= Trough, R = Round, G = Goaty, P = Pendulous

The mean values of teat length and diameter ranged from 5.21 ± 0.27 cm in pear shaped teats to 5.96 ± 0.12 cm in bottle shaped teats, 2.04 ± 0.08 cm in pear shaped teats to 2.86 ± 0.06 cm in bottle shaped teats, respectively (Table 4). The differences observed in mean teat length and diameter due to different shapes of teats was statistically highly significant (P < 0.01). The teat measurements in crossbred cows were lowest in pear shaped teats and highest in bottle shaped teats.

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Table 4: Mean teat length and diameter (cm) in different shaped teats in Crossbred cows

Teat shape	Av. Teat length		Av. Teat diameter	
	Mean ± S. E.	C. V. %	Mean ± S. E.	C. V. %
Cylindrical	5.41^{ab} ± 0.10	25.58	2.60^{b} ± 0.05	28.96
Funnel	5.58^{bc} ± 0.08	28.27	2.70^{bc} ± 0.04	27.05
Bottle	5.96^{c} ± 0.12	27.01	2.86^{c} ± 0.06	27.56
Pear	5.21^{a} ± 0.27	30.85	2.04^{a} ± 0.08	22.38
Overall	**5.73 ± 0.06**	**27.75**	**2.68 ± 0.03**	**28.36**

Means with different superscripts in columns differ significantly (P<0.01)

Conclusion

The frequencies of trough (bowl) were highest followed by round, goaty and pendulous type udder. Similarly, the frequencies of cylindrical shaped teats was highest followed by Funnel, Bottle and Pear shaped teats. The frequency of trough shape udders was maximum in first to fourth parity cows. Pendulous shaped udder showed an increasing trend with advancement in parity being lowest in first parity cows and highest in fifth and above parity cows.

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