

Original Research Article

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Effect of Parity on Udder Morphometry and its Association with Milk Yield of Jersey Crossbred Cows

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ABSTRACT

Keywords

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The research work was conducted to know the relationship of udder and teat morphological characteristics with total lactation yield of crossbred cows. A total of seventy five Jersey crossbred cows with different parities were randomly selected from organised and private dairy farms of Tirunelveli, Thoothukudi and Tenkasi districts of Tamil Nadu. Udder length (UL), udder width (UW), udder depth (UD), fore teat length (FTL), rear teat length (RTL), fore teat diameter (FTD) and rear teat diameter (RTD) were measured at the beginning of lactation. The total milk yield (TMY) measured throughout the lactation period. Udder length, width and depth among different parities differed significantly ($P < 0.01$). The length of fore teat and rear teat were significantly differ between different parities ($P < 0.01$) but the diameter of teats were not differ significantly. Gradual increases of udder and teat measurements have been observed upto fifth parity. The total milk yield of Jersey crossbred cows significantly correlated with udder depth (0.442) and non-significantly correlated with udder length (0.201) and udder width (0.121).

Introduction

Milk production of India increases consistently from 176.3 million tonnes in 2017-18 to 187.7 million tonnes in 2018-19 and registering a growth of 6.5 per cent (BAHFS, 2019). However, the crossbred cattle population of India is less and the total milk produced from the crossbred cattle is more compared to indigenous cattle. Indigenous buffaloes contributed nearly 35% of total milk production followed by crossbred cattle (26%), non-descript buffaloes

(14%) and Indigenous cows (11%). In India, as per 2019 livestock census 50.42 million (26.19%) exotic/crossbred cattle recorded in a total of 192.49 million cattle population. Similarly, exotic and crossbred cows contribute significant role (6.48 million tonnes) in total milk production of Tamil Nadu (7.1 million tonnes).

Physical characters of udder and teat have a direct correlation on milk yield of dairy cows and buffaloes. Variations in udder and teat characters are observed between breeds and

individuals in the same herd with respect to parity and lactation stages. Udder is the first site of judgment for judging the milk production potential of dairy animals in our country (Khatri *et al.*, 2017).

Dairy farmers are unaware of knowledge on udder morphometry and its relationship with milk production. They are not maintaining proper production records of their animals in an organised manner.

While selecting the high yielding dairy cows, it is necessary to know the udder and teat measurements and its association with total milk yield. Hence, this study was conducted in Jersey crossbred cows to investigate effect of parity on udder and teat measurements and its relationship with total lactation yield.

Materials and Methods

The study was conducted in dairy herds of Tirunelveli, Thoothukudi and Tenkasi districts of Tamil Nadu. The udder and teat measurements were recorded for 75 lactating Jersey crossbred cows with different parities. All the parameters have been recorded from beginning of the study and milk yield was recorded for the complete lactation period of cows.

Udder length (UL) was measured as a distance from the rear attachment of udder below the vagina and moving along udder body up to the fore attachment, where fore udder blends smoothly with the body of the animal. Udder width (UW) was measured as a distance between widest point of udder near the stifle joint of animal and passing it in between the fore and rear teats, to the widest point of udder near the stifle joint of the other side by using measuring tape. Udder depth (UD) was measured as the distance between the roof of the udder to the floor of the udder.

Teat length (TL) was measured from the base of teat up to its tip. Considering the uneven size of teats from the same animal, the length of all four teats i.e. All four teat length were recorded using the measuring scale and teat diameters were measured with the help of Vernier caliper. The milk yield of Jersey crossbred cows were measured throughout the lactation.

An analysis of variance was employed to compare udder and teat measurements with total milk yield between different parity groups of Jersey crossbred cows. The correlation between the udder and teat measurements and total milk yield was performed using a Pearson's correlation coefficient test. The statistical analysis was made using SPSS 16.0 (IBM Corporation, Armonk, New York, USA).

Results and Discussion

The mean \pm SE values of udder length, width and depth (cm) in different parities ranged from 49.61 \pm 1.16 to 55.48 \pm 1.22, 46.23 \pm 1.38 to 55.16 \pm 0.88 and 15.12 \pm 0.92 to 19.76 \pm 0.38, respectively (Table 1). The results indicate that multiparous cows had a significant larger volume of udder than primiparous cows. Significant ($P < 0.001$) increasing trend in length, width and depth of the udder from 1st to 2nd parity at the rate of 23.82, 22.53 and 2.52 per cent, respectively. Modh *et al.*, (2017) reported that different parity groups had the udder length, width and depth of 50.88 \pm 4.29 to 65.44 \pm 5.68, 53.83 \pm 3.95 to 72.55 \pm 5.55 and 24.22 \pm 1.20 to 30.38 \pm 3.07 cm, respectively.

Perusal of data shows that the gradual increase in udder measurement as the parity increases and had declining trend from 4th parity onwards in Jersey and Red Sindhi crossbred cows (Ghosh and Prasad, 1998) and Murrah buffaloes (Prasad *et al.*, 2010).

Lavana *et al.*, (2011) and Khrati *et al.*, (2017) observed the gradual increase in udder measurements upto 4th parity and declining trend from 5th parity onwards in Surti buffaloes.

Table.1 Effect of parity on udder measurements of Jersey crossbred cows

Parameter	Parity	Mean±SE	F Value	P Value
Udder Length (cm)	1 (n=20)	49.61±1.16	4.881	0.002
	2 (n=18)	49.02±0.91		
	3 (n=17)	50.45±0.93		
	4 (n=10)	53.33±1.0		
	>5 (n=10)	55.48±1.22		
Udder Width (cm)	1 (n=20)	46.23±1.38	4.269	0.004
	2 (n=18)	48.75±1.80		
	3 (n=17)	50.64±1.25		
	4 (n=10)	51.25±0.94		
	5 (n=10)	55.16±0.88		
Udder Depth (cm)	1 (n=20)	15.12±0.92	5.223	0.001
	2 (n=18)	16.68±0.63		
	3 (n=17)	18.14±0.49		
	4 (n=10)	19.71±1.88		
	5 (n=10)	19.76±0.38		

Table.2 Effect of parity on teat measurements of Jersey crossbred cows

Parameter	Parity	Mean±SE	F Value	P Value
Front Teat Length (cm)	1 (n=20)	4.68±0.69	4.851	0.002
	2 (n=18)	5.07±0.87		
	3 (n=17)	5.22±0.16		
	4 (n=10)	5.37±0.26		
	>5 (n=10)	5.57±0.25		
Rear Teat Length (cm)	1 (n=20)	4.34±0.06	3.653	0.009
	2 (n=18)	4.71±0.07		
	3 (n=17)	4.62±0.13		
	4 (n=10)	4.88±0.23		
	5 (n=10)	5.00±0.23		
Front Teat Diameter (cm)	1 (n=20)	2.78±0.17	0.197	0.939
	2 (n=18)	2.68±0.21		
	3 (n=17)	2.69±0.01		
	4 (n=10)	2.70±0.02		
	5 (n=10)	2.66±0.29		
Rear Teat Diameter (cm)	1 (n=20)	2.68±0.18	1.939	0.161
	2 (n=18)	2.69±0.02		
	3 (n=17)	2.68±0.01		
	4 (n=10)	2.69±0.02		
	5 (n=10)	2.78±0.06		

Table.3 Correlation coefficient of total lactation yield with various udder and teat measurements of Jersey crossbred cows

	TMY	UL	UW	UD	FTL	RTL	FTD	RTD
TMY (kg)								
UL (cm)	0.201							
UW (cm)	0.121	0.348**						
UD (cm)	0.442**	0.315**	0.307*					
FTL (cm)	0.134	0.232	0.438**	0.239*				
RTL (cm)	0.078	0.068	0.236	0.179	0.188			
FTD (cm)	0.180	0.193	0.171	0.219	-0.044	-0.099		
RTD (cm)	-0.003	0.168	0.035	0.035	0.039	0.091	0.030	

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

The mean±SE values of fore and rear teat lengths were 4.68±0.69 to 5.57±0.25 cm and 4.34±0.006 to 5.00±0.23 cm, respectively. The fore teat and rear teat length between different parities ranged from 4.68±0.69 to 5.57±0.25 and 4.34±0.06 to 5.00±0.23 cm, respectively and differed significantly (P<0.01) (Table 2). Kuczaj Marina (2003) observed that as the advancement in parity of Holstein crossbred cows the fore teat length has also increased. Extremely significant effect of parity on teat length has been observed in Vrindavani cattle and Gir cows (Singh *et al.*, 2010 and Singhai *et al.*, 2013). The mean±SE values of front teat diameter and rear teat diameter ranged from 2.78±0.17 to 2.66±0.29 and 2.68±0.18 to 2.78±0.06, respectively. The teat diameter between different parities was not differed significantly (Table 2). Similar results were observed by Modh *et al.*, (2017) in Gir cows.

Correlation coefficients between the total milk yield and udder depth (0.442) were found highly significant (P<0.01) (Table 3). Mingoas *et al.*, (2017) reported that the depth and height of udder had highly significant (p<0.001) effects on milk yield. Udder length, width and depth were positively correlated with milk yield of buffaloes (Khrati *et al.*, 2017; Prasad *et al.*, 2010) and crossbred cows

(Patel *et al.*, 2016). The test day milk yield was correlated with udder and teat measurements of Gir cows, Vrindavani cattle and Crossbred cows (Modh *et al.*, 2017, Singh *et al.*, 2031 and Deng *et al.*, 2012). The udder length was correlated with udder width (0.348) and depth (0.315), udder width was correlated with udder length (0.348) and depth (0.307) and the udder depth was correlated with udder length (0.315) and width (0.307), respectively (Table 3). The results of the udder measurements were closely interrelated and reflect that all three udder morphometric characters (length, depth and width) must be the vital criteria for selection of dairy cows.

The total milk yield of Jersey crossbred cows were not correlated with teat measurements. The result was similar to the report of Gupta *et al.*, (1991) in Karan Fries cows and Patel *et al.*, (2016) in crossbred cows and Mingoas *et al.*, (2017) in Zebu cows of North region of Cameroon, they reported that correlation coefficient of teat length and teat diameter with total milk yield were not significant.

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In conclusion the correlation coefficients between milk yield and udder measurements are useful in the selection of dairy cows. While considering the parity of dairy cows the gradual increase of udder and teat measurements have been observed upto fifth parity. Beyond five calving it may not have significant effect on udder morphometry. By applying this method of correlation will be useful for genetic improvement of dairy cows in organized farms and farmers field.

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