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Udder and Teat Biometry and Its Relation with Milk Production in Different Strains of Deoni Cattle

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Abstract

The present study was conducted on 256 Deoni cattle in 13 villages and LRIC (Deoni) of Bidar district, which were included in the project "Field Performance Recording of Deoni cattle in Bidar district" as part of Rashtriya Gokul Mission. The strain-wise udder and teat biometry, lactation milk yield and correlations were studied. The overall mean of udder length, udder width and udder depth were found to be 41.476 ± 0.3570, 37.773 ± 0.4770 and 15.238 ± 0.1070 cm, respectively. The overall mean of fore teat length, rear teat length, fore teat diameter and rear teat diameter were found to be 3.968 ± 0.0790, 3.505 ± 0.0750, 2.029 ± 0.0130 and 1.930 ± 0.0120 cm, respectively. The overall mean lactation milk yield was found to be 1173 ± 33.868 kg. There was no significant effect of strain on any of udder and teat parameters or lactation milk yield.

Keywords: Correlation, Deoni Cattle, Milk Production, Strains, Teat Biometry, Udder Biometry

Introduction

Animal husbandry and dairying activities play an important role in the socio-economic development of rural households. India is the highest milk producer in the world. Its milk production increased consistently from 55.6 MT in 1991-92 to 176.3 MT in year 2017-18 (NDDB, 2018). Milk yield is an important selection criterion in dairy cattle breeding. Some anatomical attributes are considered related to milk production. The udder of the cow is one of the most important criteria used to predict production performance. Type traits have been used as indirect selection criteria for herd life. Udder dimensions have been reported heritable (Qureshi *et al*., 1980). Type traits are recorded relatively early in life of animals and are medium to high heritable, which makes selection relatively more efficient. Udder height was better predictor of lactation performance (Lin *et al*., 1987). Differences in udder shape and size were reported heritable (Liebenberg and Jannermann, 1958). A large sized udder with large proportion of glandular tissue and a symmetrical shape is an asset to milch animals. The udder characteristics were reported to be important in relation to milk production, where production records were lacking (Akhtar and Thakuria, 1998). Udder is the first site inspected while judging of dairy cattle by local brokers or animal husbandry men in our country for assessing the milking ability of animals. Therefore, it is more important to have knowledge of morphology of udder and teats and its relation with milk yield. Indian cattle breeds are described on the basis of colour, shape, body size, horn but very little information is available on udder characteristics. The size and shape of udder are very important conformation traits which could play a vital role for the suitability of economical milk production and should be considered for selecting dairy animals (Bhuiyan *et al*., 2000).

Materials and Methods

The present study was conducted on 256 Deoni cattle in 13 villages and LRIC (Deoni) of Bidar district, which were included in the project "Field Performance Recording of Deoni cattle in Bidar district" as part of Rashtriya Gokul Mission. The strain-wise biometry of udder and teat, lactation milk yield and correlations were studied. The data was collected by measuring udder (length, width and depth) and teat (length and diameter) biometry. Effort was made to avoid obvious mechanical error while recording measurement of udder and teat. Arrangement was made to stand the animal on even surface and in normal position at the time of recording the measurement, all measurements were recorded in centimetre.

Statistical Analysis

Statistical analysis was done using SAS software version 9.3 (2010) using General Linear Model (GLM) procedure.

Results and Discussion

Least square means of udder length, udder width and udder depth are given in Table 1. The overall udder length, width and depth were 41.476 ± 0.3570, 37.773± 0.4770 and 15.238 ± 0.1070 cm, respectively. However, no significant difference was observed in between different strains. Udder length was highest in Wannera and lowest in Shevera strain of Deoni cattle, udder width was highest in Balankya and lowest in Shevera and udder depth was highest in Balankya and lowest in Shevera strain. The comparable value of udder length, width and depth were reported by Tomer *et al*. (1973) in Hariana cattle, udder width and depth by Kadam (2018) in Deoni cattle.

However, lower udder length, width reported by Sampathkumar (2018) in Ongole cattle. In contrast higher udder length, width and depth reported by Modh *et al*. (2017) in Gir cows. Similarly, higher udder length and width reported by Quereshi *et al*. (1980) in Gir, Tripathi *et al*. (1982) in Gir and Waghmare and Siddiqui (2000) in Holdeo crossbred cows. The least square means for fore teat length, rear teat length, fore teat and rear teat diameter are given in Table 2. The overall mean for fore teat, rear teat length, fore teat and rear teat diameter were 3.986 ± 0.0790, 3.505 ± 0.0750, 2.029 ± 0.0130 and 1.930 ± 0.0120 cm, respectively. FTL was highest in Balankya and lowest in Shevera strain. However, FTD was highest in Balankya and lowest in Wannera strain of Deoni cattle. The comparable value of fore and rear teat length, fore and rear teat diameter reported by Kadam (2018) in Deoni cattle. However, lower teat length was reported by Tripathi *et al*. (1982) in Gir. In contrast higher value of teat length and teat diameter was reported by Waghmare and Siddiqui (2000) in Holdeo crossbred cow and Lavania *et al*. (2011) in Surti buffalo. The least square means for LMY of Deoni cattle is given in Table 3. The overall mean for LMY of Deoni cattle was observed to be 1173.77 ± 33.868 kg. However, no significant difference was observed in between different strains. The LMY was highest (1327.29 ± 78.828 kg) in Balankya and lowest (1115.50 ± 46.899 kg) in

Shevera strain of Deoni cattle. Lower LMY in Deoni cattle reported by Thombre *et al*. (2001) (518.23 ± 22.44 kg), Chakravarthi *et al*.(2002)(238.86 ± 76.00 kg) and Shingare *et al*. (2015) (236.43 ± 12.71 kg).The LMY values obtained in this study are comparable with Gatchearle *et al.* (2009) (1193.22 ± 44.79 kg), Das *et al*.(2012)(911.14kg), Patil (2014) (881.35±37.64kg) and Basak and Das (2018) (819.98 ± 16.50 kg). The correlation of udder and teat measurements is presented in Table 4. All udder measurements had significant and low correlation with LMY. Similarly, all teat measurements had significant and moderate correlation with LMY in present study. Similar results were reported by Tripathi *et al*. (1982) who found significant to highly significant correlations of teat length and teat diameter with milk yield in Gir cows, Quereshi *et al*. (1980) observed that teat length and diameter had significant correlation with milk yield in Gir cows, Waghmare and Siddiqui (2000) reported strong correlations of udder length, udder width and depth with lactation milk yield in Holdeo crossbred cows and Singhai *et al*. (2013) observed that teat diameter had significant correlation with milk. However, non-significant correlation of udder depth with milk yields in Gir cows. Contrary to the present study, Modh *et al.* (2017) observed non-significant correlation of udder length and udder depth with milk yield in Gir cows and Kadam (2018) reported non-significant correlation of all udder and teat measurements with test day milk yield in Deoni cattle.

Tomar (1973) studied udder and teat measurements and their relation with milk production in Hariana cattle and reported mean udder length, width, depth, fore teat length and rear teat length were 39.4 ± 0.65, 34.3 ± 0.57, 17.8 ± 0.43, 4.8 ± 0.12 and 3.6 ± 0.12 cm, respectively. Quereshi *et al*. (1980) studied inheritance of udder measurements and their correlation with test milk yield in 72 Gir cows and reported udder length, width and depth were 53.80 ± 0.44, 50.11 ± 0.40 and 13.61 ± 0.39 cm, respectively. Prajapati *et al*. (1995) studied size and shape of udder and teats and found mean udder length, width and depth were 59.58 ± 0.36, 63.18 ± 0.45 and24.95 ± 0.22 cm, respectively, in Kankrej cows. Waghmare and Siddiqui (2000) studied correlation of different udder and teat measurement with lactation milk yield in case of 85 Holdeo (HF x Deoni) crossbred cows and reported the mean udder length, width, depth, fore and rear teat length, fore and rear teat diameter were 49.87 ± 0.56, 51.08 ± 0.58, 14.65 ± 0.20, 7.32 ± 0.09, 6.72 ± 0.09, 1.59 ± 0.03 and 1.47 ± 0.03 cm, respectively. Lavania *et al*. (2011) conducted a study on udder measurements traits in 51 Surti buffaloes and reported the overall least square means for udder length, width, depth, fore and rear teat length, fore and rear teat diameter were 45.0 ± 0.7, 49.4 ± 1.4, 9.4 ± 0.5, 6.9 ± 0.3, 7.7 ± 0.4, 8.1 ± 0.4 and 9.4 ± 0.3 cm, respectively. Singhai *et al*.(2013) studied udder and teat morphology, body measurements and their relationship with milk yield and milking traits in Gir cows, reported mean udder length, width, depth, teat length and teat diameter were 45.99 ± 2.07, 20.51 ± 0.99, 20.29 ± 104, 7.07 ± 0.42, 3.49 ± 0.21, cm, respectively. Patel *et al.* (2016) studied udder and teat measurements and their relation with milk production in 200 crossbred animals maintained at dairy farms of Anand district, Gujarat state and reported average udder length, width, depth, fore teat length, rear teat length, fore teat diameter and rear teat diameter were 58.24 ± 0.68 cm.65.45 ± 0.70, 23.06 ± 0.34, 6.07 ± 0.05, 5.39 ± 0.05 2.72 ± 0.12 and 2.64 ± 0.02 cm, respectively. Modh *et al*. (2017) conducted a study on effect of parity on udder and teat biometry on 150 milking Gir cows of Anand, Gujarat state and reported average udder length, width, depth, fore teat length, rear teat length, fore teat diameter and rear teat diameter were 61.95 ± 1.20, 62.99 ± 1.17, 25.62 ± 0.43, 9.62 ± 0.19, 8.64 ± 0.18, 3.7 ± 0.17 and 3.65 ± 0.06 cm, respectively.

Kadam (2018) studied relationship of size and shape of udder and teats with milk yield in Deoni cattle at Latur district of Maharashtra state, based on 400 observations found mean udder length, width, depth, fore teat length, rear teat length, fore teat diameter and rear teat diameter were 55.11 ± 1.35, 40.53 ± 0.38, 16.58 ± 0.20, 5.14 ± 0.01, 4.41 ± 0.01, 2.46 ± 0.01 and 1.89 ± 0.01 cm, respectively. Thombre *et al*. (2001) studied the breeding records of Deoni cattle reared at Marathwada Agricultural University dairy farms over a period of 21 years (1974 to 1994) and reported LMY to be 518.23 ± 22.44 kg, based on 544 observations. Chakravarthi *et al*. (2002) reported LMY to be 238.86 ± 76.00 kg, based on 54 lactation records of 30 Deoni cows maintained at Dairy Experimental Station, Hyderabad. Singh *et al*. (2002) studied from 69 villages of 10 strata from the Latur district and one stratum each from the Parbhani, Nanded and Osmanabad districts of Maharashtra State and reported LMY to be 868.24 ± 49.56 liters, based on total of 597 Deoni cows.

Das *et al*. (2012) reported LMY to be 911.14 kg in the NDRI Southern Regional Station herd of Deoni cattle at Bangalore. Patil (2014) studied lactation performance of 82 Deoni cows in field condition of Bidar district and reported LMY of 881.35 ± 37.64 kg. Shingare *et al*. (2015) studied the sample of dataset comprising 438 lactations of 114 Deoni cows over a period of 25 years between the periods 1988 to 2012 maintained at CCBP, Vasantrao Naik Marathwada Agriculture University, Parbhani and reported LMY to be 236.43 ± 12.71 kg. Basak and Das (2018) conducted a study on 710 lactation records of 274 Deoni cattle maintained at ICAR-NDRI, Southern Campus,

Bangalore and reported overall mean LMY to be 819.98 ± 16.50kg. Quereshi *et al*. (1980) studied inheritance of udder measurements and their correlation with test milk yield in 72 Gir cows and reported that udder length was correlated significantly genetically and phenotypically with milk yield. Tripathi *et al*. (1982) found that udder length teat length and teat diameter had significant correlations with test day milk yield in Gir cows. Waghmare and Siddiqui (2000) reported strong correlations of lactation milk yield with udder length (0.49), width (0.44) and depth (0.52), in 85 Holdeo (HF x Deoni) crossbred cows. Lavania *et al*. (2011) reported that, the correlation and regression among test day and 100-day milk yield with udder length, udder width and udder depth were positive and non-significant in 51 Surti buffaloes. Singhai *et al*. (2013) in Gir cows found significant correlation of milk yield with udder length (r = 0.33), udder depth (r = 0.28) and teat diameter (r =0.27). However, non-significant with udder depth and teat length. Patel *et al*. (2016) reported that the correlation between milk yield and various udder measurements viz., udder length (0.499), udder width (0.413) and udder depth (0.178) were found to be positive and significant (P<0.05) to highly significant (P<0.01) in milking herd of crossbred cows. Modh *et al*. (2017) found that the correlation between milk yield and udder width (0.194) was positive and significant (P<0.05) while correlation between milk yield and udder length (0.128), udder depth (0.157) and all teat measurements had non-significant correlation in Gir cows. Kadam (2018) reported that udder and teat measurements had non-significant correlation with test day milk yield in Deoni cattle.

Table 1: Least square means of udder length, udder width and udder depth(cm)

Strain	Udder length	Udder width	Udder depth
Wannera	42.355 ± 0.6515	38.302± 0.8770	15.217± 0.1957
Shevera	40.748 ± 0.4888	37.266± 0.6580	15.122 ± 0.1468
Balankya	42.177 ± 0.8467	38.400± 1.1398	15.622 ± 0.2543
Overall	41.476 ± 0.3570	37.773± 0.4770	15.238± 0.1070

Table 2: Least square means of teat length and teat diameter (cm) in Deoni cattle

Strain	Fore teat length	Rear teat length	Fore teat diameter	Rear teat diameter
Wannera	3.984 ± 0.1444	3.586 ± 0.1386	2.008 ± 0.0307	1.904 ± 0.0218
Shevera	3.921 ± 0.1084	3.454 ± 0.1040	2.035 ± 0.0177	1.938 ± 0.0163
Balankya	4.084 ± 0.1877	3.524 ± 0.1802	2.045 ± 0.0236	1.951 ± 0.0283
Overall	3.986 ± 0.0790	3.505 ± 0.0750	2.029 ±0.0130	1.930 ± 0.0120

Table 3: Least square means of lactation milk yield (kg) in Deoni cattle

Strain	Lactation milk yield (kg)
Wannera	1180.36 ± 60.907
Shevera	1115.50 ± 46.899
Balankya	1327.29 ± 78.828
Overall	1173.77 ± 33.868

Table 4: Correlations of udder and teat measurements with LMY

Trait	LMY	UL	UW	UD	FTL	RTL	FTD
UL	0.1654**						
UW	0.1448*	0.8790**					
UD	0.1581*	0.6890**	0.8125**				
FTL	0.2213**	0.5513**	0.5250**	0.4754**			
RTL	0.2369**	0.5324**	0.5143**	0.4519**	0.9414**		
FTD	0.2079**	0.5055**	0.5283**	0.5973**	0.6129**	0.6241**	
RTD	0.2229**	0.4645**	0.5154**	0.5897**	0.5795**	0.6048**	0.9334**

**P < 0.05, **P < 0.01*

Conclusion

In the present study there was no significant effect of strain on all udder and teat measurements. The udder length and rear teat length were highest in Wannera strain. Similarly, udder width, udder depth, fore teat length, fore and rear teat diameter were highest in Balankya strain. The correlation studies showed that all udder and teat measurements had significant and low to moderate correlations with lactation milk yield. These findings indicate that udder and teat biometry should be an important criterion for selection of high yielding Deoni cattle.

Conflict of Interests

There is no conflict of interest.

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