INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

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UDDER AND TEAT MEASUREMENTS AND THEIR RELATION WITH MILK PRODUCTION IN BUFFALOES

[a*]Khatri, S.B., [a]Trivedi, M.M., [b]Patel, Y.G., [a]Rajpura, R.M.
[a*] Livestock Production Management, College of veterinary Sci. & A.H, AAU, Anand
[a] Department of Animal Science, B.A. College of Agriculture,
[b]Livestock Research Station, College of Veterinary Science & A.H., AAU, Anand.
*Corresponding author email: khatrisunil21@gmail.com

ABSTRACT
The present investigation was conducted on the milking herd of buffaloes and the following conclusions were derived: The average length, width and depth of udder were 58.24 ± 0.68 cm, 65.45 ± 0.70 cm and 23.06 ± 0.34 cm, respectively. All the measurements were found to be increase with the increment in lactation number. The average length of fore teats was found to be non-significantly longer than rear teats (6.07 cm VS 5.39 cm). The correlations between milk yield and various udder measurements *viz*., udder length (0.499), udder width (0.413) and udder depth (0.178) were found positive and significant (P<0.05) to highly significant (P<0.01).

KEYWORDS: udder, teat, length, width, depth, milk yield.

INTRODUCTION

In India, the buffalo population is approximately 108.7 millions. Out of the total production of milk, 51 % comes from buffaloes and 44 per cent from cows. In Gujarat, buffalo milk production is 56 % of total milk production (Anonymous, 2014). The sub-clinical form of mastitis is 15 to 40 times more prevalent than the clinical form and usually precedes the clinical form and is of long duration (Seegers *et al*., 2003). It is important to emphasize that the sub-clinically affected animals remain a continuing source of infection for herd mates (Islam *et al*., 2011). Two decades ago, the mean incidence of clinical mastitis in India was 1-10 % with subclinical mastitis ranging from 10-50 % in cows and 5-20 % in buffaloes, while recent studies showed higher incidence of subclinical mastitis ranging from 20 to 83 per cent in cows and 45 % in buffaloes (Sharma and Sindhu, 2007). Udder is the first site judgment 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 morphology of udder and teats and its relation with the mastitis within this subclinical mastitis.

MATERIALS & METHODS

The data for the present study were collected from the milking buffaloes. The following observations were made on 150 buffaloes (1) udder length, (2) udder width, (3) udder depth, (4) teat length, (5) teat diameter, (6) test day milk yield. The udder length was measured from the rear attachment of the udder, near the escutcheon, to the front of the udder where it blends smoothly with the body. The udder width was measured as a distance between two lateral lines of attachment of the udder to abdominal wall, beneath the flank. The measuring tape was kept in position on one side of the buffalo, under flank, near the stifle joint and it was passed over in between fore and rear teats to the other side. The udder depth was measured by subtracting distance from the barn floor to the udder floor from distance from the barn floor to the base of the udder. Teat length was measured from the upper part of the teat, where it hangs perpendicularly from the quarter to the tip. Teat length was measured to the nearest 0.01 cm using Vernier Caliper. Teat diameter was measured at the mid- point length by Vernier Caliper to the nearest 0.01 cm. All four teats were measured individually and average length was worked out. All the measurements were taken one to two hours before the evening milking after securing the animals properly in a standing position on a leveled floor for the accuracy. All the measurements were recorded in centimeters. Statistical analysis was done using standard procedures (Snedecor and Cochran, 1994).

RESULTS & DISCUSSION

The mean values of udder length, width and depth in different parities ranged from 54.69 ± 1.69 to 62.61 ± 2.67 cm, 49.12 ± 1.31 to 54.25 ± 2.11 cm and 17.84 ± 0.56to 20.33 ± 0.44 cm, respectively (Table 1). Perusal of data showed a gradual increase in udder length, width and depth as the number of parity increases except for the udder length and the udder width, which showed a declining trend in 5th and 6thparity onwards, and udder depth which showed declined in 3rd parity and again increased in 4th parity onwards. Ghosh and Prasad (1998) and Prasad *et al*. (2010) also found a decline in udder length in 4th parity of Jersey × Red Sindhi and Murrah buffaloes, respectively. Results indicated that multiparous buffaloes had a significant (P<0.05) larger volume of udder than the primiparous buffaloes. The differences observed in udder length in different parities were statistically significant (P<0.05). Lavania *et al*. (2011) also reported gradual increase in udder measurement with

parity that declined in 5th parity onwards in Surti buffaloes.

TABLE 1: Udder measurements of buffaloes in different parities

Parity	Udder Measurements (cm)		
	Udder length	Udder width	Udder depth
1	$54.69^{a} \pm 1.69$	49.12 ± 1.31	18.44 ± 1.06
2	$59.86^{ab} \pm 1.83$	52.34 ± 1.70	17.84 ± 0.56
3	$61.01^{bc} \pm 1.97$	54.20 ± 1.90	20.25 ± 0.94
4	$62.61^{c} \pm 2.67$	54.25 ± 2.11	19.28 ± 1.04
5	$59.07^{ab} \pm 2.16$	51.43 ± 2.38	20.24 ± 1.22
≥ 6	$56.5^{ab} \pm 1.62$	49.87 ± 2.12	20.33 ± 0.44

Means with different superscripts within the column differ significantly (P< 0.05)

The mean values along with standard error of various teat measurements of buffaloes in different parities are shown in Table 2. Mean fore teat length and rear teat length of buffaloes in different parities ranged from 6.24 ± 0.36 to 7.45 ± 0.23 cm and 6.32 ± 0.27 to 7.72 ± 0.48 cm, respectively. Perusal of data showed a gradual increase in length of fore and rear teat with advancement of the parity except for the fore and read teat length which showed a declining in the 5th parity and then again has increased. The differences observed in fore teat length and rear teat length in different parities were statistically significant (P<0.05). Similarly, Lavania *et al*. (2011) observed increasing teat length as parity increase except in 4th and 5th parity which showed decline in both fore and rear teat length of Surti buffaloes. Significant (P<0.05) to highly significant (P<0.01) effect of parity on teat length have been observed in Hariana cows, Tharparkar cows, Kankrej cows, Murrah buffaloes and Gir cows by earlier workers (Sharma *et al*., 1983; Prajapati *et al*., 1995;, Prasad *et al*., 2010 ; and Singhai *et al*., 2013).

TABLE 2: Teat measurements of buffaloes in different parity

Parity	Front Teat Length (cm)	Rear Teat Length (cm)	Front Teat Diameter (cm)	Rear Teat Diameter (cm)
1	$6.24^{a} \pm 0.36$	$6.57^{a} \pm 0.41$	3.28 ± 0.16	3.31 ± 0.18
2	$6.39^{a} \pm 0.25$	$6.32^{a} \pm 0.27$	3.37 ± 0.15	3.49 ± 0.14
3	$6.62^{ab} \pm 0.27$	$6.79^{ab} \pm 0.27$	3.32 ± 0.17	3.41 ± 0.14
4	$7.79^{c} \pm 0.45$	$7.72^{b} \pm 0.48$	3.69 ± 0.26	3.61 ± 0.19
5	$6.78^{ab} \pm 0.20$	$6.79^{ab} \pm 0.26$	3.65 ± 0.19	3.57 ± 0.22
≥6	$7.45^{bc} \pm 0.23$	$7.00^{ab} \pm 0.25$	3.75 ± 0.15	3.70 ± 0.18

Means with different superscripts in columns differ significantly (P< 0.05)

Correlation coefficients observed between various udder and teat measurements and test day milk yield are shown in table 3. Highly significant (P<0.01) and positive correlations were observed among the udder measurements viz., udder length, udder width and udder depth. This indicates that all three udder measurements were closely inter-related. Similar results were also observed by Tripathi *et al*. (1982) in Gir cows, Saiyed (1987) in Jersey × Kankrej F1 cows, Ahlawat *et al*. (2008) in Sahiwal cows, Prasad *et al*. (2010) in Murrah buffaloes and Singhai *et al*. (2013) in Gir cows, similarly, positive and significant (P<0.05) to highly significant (P<0.01) association of udder width and udder depth with average rear teat length, fore teat diameter, rear teat diameter, overall teat length and overall teat diameter was observed in present study. However, the correlation of udder length with all other traits was highly significant (P<0.05) association of udder length, udder width and udder depth with overall teat length and overall teat diameter in Gir cows.

TABLE 3: Correlation coefficients between various udder and teat measurements and test day milk yield in buffaloes

	MY	UL	UW	UD	FTL	RTL	FTD	RTD	AV. TL	AV. TD
MY										
UL	0.416**									
UW	0.343**	0.687**								
UD	0.461**	0.417**	0.451**							
FTL	0.045	0.319**	0.156	0.140						
RTL	0.048	0.338**	0.169*	0.091*	0.844**					
FTD	0.034*	0.256**	0.184*	0.197*	0.360**	0.382**				
RTD	0.050	0.212**	0.176*	0.218**	0.315**	0.352**	0.783**			
AV. TL	0.048	0.342**	0.169*	0.120	0.959**	0.961**	0.386**	0.348**		
AV. TD	0.044	0.248**	0.190*	0.220**	0.357**	0.389**	0.944**	0.944**	0.389**	

* P < 0.05, ** P < 0.01

The correlations observed between various teat measurements, viz., fore teat length, rear teat length, fore teat diameter and rear teat diameter were also highly significant (P<0.01) Prasad *et al*. (2010) reported highly

significant (P<0.01) correlation between the teat length and teat diameter. The correlations between milk yield and various udder measurements, viz., udder length (0.416), udder width (0.343) and udder depth (0.461) were found positive and highly significant (P<0.01).These findings reflects that, all the three udder measurements should be the important criteria for selection of buffaloes as the udder length, width and depth decides the capacity of udder which reflects the milk yield. Prasad *et al*. (2010) also reported significant (P<0.05) and positive correlation of udder width, length, depth with average test day milk yield in Murrah buffaloes. Waghmore and Siddiqui (2000) reported strong correlation of milk yield with udder length (0.49), width (0.44) and depth (0.52) in Holdeo crossbred cows. Similar findings have been reported in Vrindavani cattle by Singh *et al*. (2010). Deng *et al*. (2012) also reported significant (P<0.05) correlation of udder length (0.64) with milk yield in Kenana × Friesian crossbred cows.

In present study, all the teat measurements showed non-significant relation with milk yield except the fore teat diameter which had positive and significant ((P<0.05)association with milk yield. Gupta *et al*. (1991) while working on Karan-fries cow, reported that all four teats diameter were almost same and the correlation coefficient of teat length and diameter with milk production were not encouraging. Contrary to this, Prasad *et al*. (2010) reported positive and highly significant correlation of average teat diameter with milk yield in Murrah buffaloes.

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