



Skin measurements in relation to milking traits in Murrah buffaloes*

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Murrah, an important breed of buffalo known for its high milk yield potential as well as high fat percentage in milk, is in great demand all over the world. These animals, although a well defined animal genetic resource, show great variation in number of external morphometric characters as well as other economic traits under field conditions (Charlini and Sinniah 2015). One of the traits that may be associated with selection and judging of these animals for their economic characters is skin thickness. It is commonly asserted that on an average, large animal with soft and thin skin produce more milk and less fat percentage in their milk, and vice-versa. From early days, breeders have tried to establish relationship of some external characteristic with milk production so that early selection of dairy animals is possible. In this attempt, several studies have been conducted to establish relationship between some breed characteristics of dairy animals with milk production (Bhatnagar and Kumar 1980, Hamid *et al.* 2000, Bharadwaj *et al.* 2007, Kshatriya *et al.* 2009). However, conflicting reports have been published regarding the relationship of skin thickness with the milk production. Although work has been done in cattle and their crossbreds, scanty literature is available for the relationship of skin thickness with milk production in buffaloes. The present study was therefore taken up to investigate the variability of skin thickness of Murrah buffaloes in relation to their milking traits.

Murrah buffaloes (30) in third to fifth parity that were in early stage of lactation (30–60 days in milk) were selected and kept under uniform managemental conditions at Livestock Research Centre, SVPUAT, Meerut. These buffaloes were milked twice a day, i.e. morning and evening by hand milking and the calves were allowed to suckle their mother for let-down of milk. The milking was performed by full-hand method using both hands from beginning of milking till the end of stripping. Skin fold thickness was measured at 5 sites. The areas of measurements were

carefully folded and lifted up while measuring the skin fold thickness so that it may not be too much stretched and the pressure exerted at the jaws of the caliper may remain uniform as far as possible. The 5 sites of skin fold thickness are as under:

- (a) Neck (SFT-N): At a point where two imaginary lines passing through length and width of the neck meet.
- (b) Chest (SFT-C): Where a vertical line at the level of the heart meets the middle one of three lines drawn horizontally to divide one side of barrel into 4 horizontal compartments.
- (c) Abdomen (SFT-A): Posterior to chest at the same level with umbilicus.
- (d) Flank (SFT-F): Midpoint of the triangular flank area.
- (e) Udder (SFT-U): About 4 inch below the rear attachment of the udder.

The data collected for skin thickness were classified into thin, moderate and thick categories based on struge's formulae for the determination of class interval and number of classes in a series of data. The data were analyzed using standard statistical procedure (Snedecor and Cochran 1989).

The mean daily milk yield for thin, moderate and thick categories of skin observed in Murrah buffaloes for various body regions are depicted in Table 1. The neck and chest regions with moderate thickness of skin produced significantly ($P < 0.01$) more milk. The flank and udder regions having thin skin fold yielded significantly ($P < 0.01$) greater milk than thick skinned animals. However, it was found that animals having thick and moderately thick skin in abdomen yielded significantly ($P < 0.01$) more milk may be due to under-skin fat deposits in these animals compared to the animals having thin and loose skin. Finzi and Cenni (1962) also reported that in general thin and pliable skin is associated with higher milk production. Bharadwaj *et al.* (2007) observed a negative and significant influence between average skin thickness and milk yield. Milk yield was higher in buffaloes having thin skin than medium and thick skinned buffaloes. Davis (1962) reported that fineness of skin is a trait positively associated with good dairy type. In our study, mean daily milk yield was estimated based on skin thickness of different body regions which were in agreement to the results of above investigator, except skin thickness of abdomen region. The effect of skin thickness

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on some of the important milking traits in lactating Murrah buffaloes also showed significant effects on milking time and milk flow rates. However, no effect was seen on the milk let-down time in Murrah buffaloes. The moderately thick skin of neck, chest and abdomen were observed to take more milking time during milking sessions. Similar trend was also found for milk flow rate in Murrah buffaloes, indicating that these animals qualify to be a good milker. The milk flow rate was higher in animals with thin skin of flank and udder regions showing negative effect of skin thickness on the milking characteristics.

The daily milk yield was negatively correlated (Table 2) with skin fold thicknesses and significant correlations were seen with skin fold thickness of flank and udder regions ($P < 0.01$). Bhatnagar and Kumar (1980) also reported negative and significant correlation coefficient between skin thickness and average milk yield measured for seven different sites in cows. They found that skin thickness of abdomen in Sahiwal cows showed maximum correlation (-0.460 ± 0.134), whereas in crossbred cows, dewlap showed

the maximum correlation (-0.2990 ± 0.093). In a similar study, Kshatriya *et al.* (2009) also found significant negative correlations ($P < 0.01$) between skin thickness at 3 sites, i.e. neck, chest and flank with milk yield in Kankrej as well as crossbred cows. In the present study, skin thickness of flank showed a maximum correlation with the milk yield in Murrah buffaloes. However, Desai and Sharma (1962) and Manik *et al.* (1981) observed no correlation between skin thickness and milk production in Haryana cattle and Murrah buffaloes, respectively. Muralidharna (2001) found lowest skin thickness during lactation period and highest during dry period in Murrah buffaloes. The actual milking time was also found to be significantly correlated with skin fold thicknesses of all regions. The milk flow rates also showed a varying degree of correlation with different skin thicknesses, although the results were significant for abdomen and udder ($P < 0.05$). The influence of skin thickness on milk fat percentage in thin, moderate and thick categories of skin is shown in Fig. 1. No significant variation was seen in fat percentage based on skin thickness, except

Table 1. Effect of skin thickness on milking traits in Murrah buffaloes

Factor	No. of observations	Daily milk yield (kg)	Milk let-down time (sec)	Milking time (sec)	Milk flow rate (gm/second)
Overall mean	150	6.44±0.18	122.25±6.77	271.90±6.77	23.87±0.45
<i>SFT-Neck</i>					
Thin	35	5.41±0.35 ^b	127.85±20.73	226.82±10.75 ^{Ab}	23.34±1.16 ^b
Moderate	70	6.67±0.29 ^c	138.42±3.17	267.79±8.32 ^b	24.79±0.50 ^a
Thick	45	3.57±0.24 ^a	142.06±15.08	214.54±12.17 ^a	19.11±0.91 ^{Ab}
<i>SFT-Chest</i>					
Thin	40	5.12±0.39 ^{Bb}	125.23±5.41	213.56±10.25 ^a	22.88±0.90 ^{Ab}
Moderate	65	6.40±0.14 ^c	123.44±10.39	253.19±6.18 ^b	25.81±0.64 ^{Bc}
Thick	45	4.13±0.45 ^{Aa}	159.66±16.29	242.39±15.31 ^{ab}	18.55±0.88 ^a
<i>SFT-Abdomen</i>					
Thin	35	2.64±0.31 ^a	151.26±20.08	216.08±8.04 ^b	15.90±1.05 ^a
Moderate	75	6.29±0.29 ^b	124.31±3.60	283.75±9.36 ^c	22.06±0.65 ^b
Thick	40	6.72±0.27 ^{bc}	132.77±16.90	209.31±9.24 ^{ab}	29.27±0.70 ^c
<i>SFT-Flank</i>					
Thin	45	8.37±0.42 ^c	119.93±15.72	301.74±12.45 ^c	27.67±0.80 ^c
Moderate	60	4.31±0.24 ^b	135.99±4.66	226.52±8.01 ^b	20.22±0.82 ^{ab}
Thick	45	2.968±0.23 ^a	152.42±15.17	180.89±9.10 ^a	19.34±0.69 ^a
<i>SFT-Udder</i>					
Thin	45	5.49±0.42	161.11±21.18	225.95±14.19	24.47±0.92 ^b
Moderate	55	4.74±0.24	141.32±4.76	234.50±6.97	20.49±0.65 ^a
Thick	50	5.41±0.23	105.91±3.14	248.70±9.67	22.27±0.64 ^{ab}

LSM showing different superscript in lowercase ($P < 0.01$) and uppercase ($P < 0.05$) letters in a column differ significantly.

Table 2. Correlation between milking traits and skin thicknesses of different body regions in Murrah buffaloes

Parameter	Daily milk yield	Milk let-down time	Milking time	Milk flow rate	Fat percent
SFT-N	-0.103	-0.098	-0.176*	0.074	0.111
SFT-C	-0.111	-0.033	0.161*	0.036	-0.398*
SFT-A	-0.051	-0.157*	-0.228**	0.189*	-0.035
SFT-F	-0.334**	-0.049	-0.375**	-0.047	0.027
SFT-U	-0.264**	-0.204*	-0.201*	-0.163*	0.110

**Correlation is significant at 0.01 level.*Correlation is significant at 0.05 level.

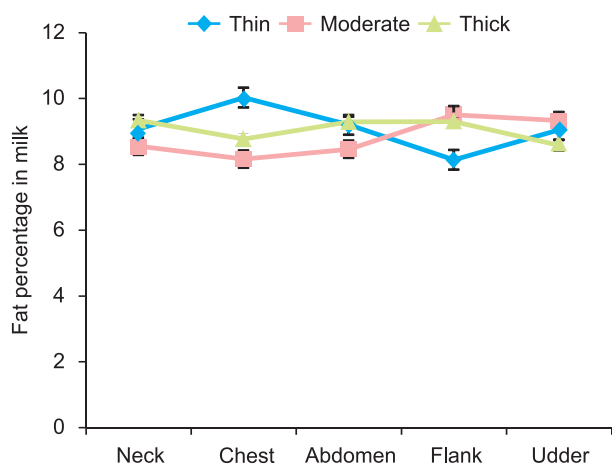


Fig. 1. Variation in fat percentage in milk based on skin thickness of different body regions.

in chest region, which was negatively correlated (-0.398). Rao and Nagarcenkar (1977) reported that differences in fat percentage in milk is attributed to breed and large breed differences for fat per cent were also due to yield level, stage of lactation and type of feeding.

It can be inferred from the study that differences in milking traits exist due to variation in skin thickness of different body region in Murrah buffaloes. The animals with thin and moderately thick skin were found to produce higher amount of milk with a greater flow rate compared to thick skinned animal. However, no such trend was observed in milk fat percentage due to variation in skin thickness. The study can be useful in selection of better animals under field conditions.

SUMMARY

There was significant effect of skin thickness on daily milk yield, milking time and milk flow rate in Murrah buffaloes. The daily milk yield was negatively correlated with skin fold thickness in these animals and significant correlations were found with skin fold thickness of flank (-0.334) and udder (-0.264) regions. The milk let down time was not affected; whereas milking time was significantly affected based on daily milk yield and milk flow rate. The milk flow rate was significantly higher for animals with thin and moderately thick skin of different body regions except abdomen (29.27 ± 0.70 g/sec). No

significant variation was seen in fat percentage based on skin thickness, except in chest region which was negatively correlated (-0.398).

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