

THE CORRELATION BETWEEN MUZZLE WIDTH, BRISKET WIDTH BETWEEN FORELEGS, AND SKIN THINNESS AT NECK REGION WITH MILK PRODUCTION IN LACTATING MURRAH BUFFALOES

ABSTRACT

The current investigation aimed to assess the correlation between morphometric characteristics and production performance in Murrah buffaloes, recognized as the premier milch breed globally. A cohort of 100 lactating Murrah buffaloes in their first to third lactation cycles was selected from the Buffalo Farm at Lala Lajpat Rai University of Veterinary and Animal Science, Hisar. The study focused on five traits: 305 days of lactation yield, muzzle width, brisket width, hip width, and skin thinness. Statistical analysis was conducted using Pearson's correlation method. The findings revealed negative correlations between lactation yield and the morphometric traits of muzzle width, brisket width, and hip width. Conversely, a positive correlation was observed between lactation yield and skin thinness. This study provides valuable insights for selecting dairy Murrah buffaloes that exhibit optimal production under field conditions, as these identified traits can be considered pivotal factors in the decision-making process for buffalo selection in dairy production systems.

Keywords: Morphometric characteristic, Murrah buffalo, Skin thinness, Production and Correlation

1. INTRODUCTION

In numerous Asian nations, including India, buffaloes (*Bubalus bubalis*) play a crucial role in ensuring food security by serving as a significant source of meat and milk for human consumption. The 20th Livestock Census of 2019 reported a buffalo population of 109.85 million in India, reflecting a 1.0% increase from the previous census. The global demand for the Murrah breed of buffalo is substantial due to its high milk fat content and potential for a substantial milk yield. Despite being a well-defined genetic resource, Murrah buffaloes exhibit considerable variation in external morphometric characteristics and other economically relevant traits under field conditions (Charlini and Sinniah, 2015). The external body parts of the buffalo contribute directly or indirectly to its milk production ability, displaying significant diversity. Field observations in Sri Lanka revealed notable variations in the external conformation and economic traits among Murrah, Surti, and Nili-Ravi buffaloes (Charlini and Sinniah, 2015). Scheinderet *al.* (2003) emphasized the importance of linear type traits in both selection and reproduction decisions for Holstein dairy cattle. This underscores the significance of considering specific physical attributes in the evaluation and breeding processes for Murrah buffaloes, especially in light of the global demand for this breed.

Zavadilova and Stipkova (2012) conducted a study on Czech Holstein cattle, revealing that linear-type traits exert a direct or indirect influence on the decisions related to selection and culling. In the context of dairy cattle, these linear type traits have been linked to both longevity and milk production (Atkins and Shannon, 2002; Renno *et al.*, 2003), serving as indirect predictors for these important traits (Esteves *et al.*, 2004). Throughout the history of breeding practices, there has been a persistent effort among breeders to establish a correlation between specific external characteristics and milk production, aiming to facilitate the early selection of dairy animals. Numerous studies, such as those by Bhatnagar and Kumar (1980), Bharadwaj *et al.* (2007), and Kshatriya *et al.* (2009), have attempted to delineate the relationship between certain breed characteristics and milk production. Despite these efforts, limited research has been undertaken to investigate the association of linear-type traits with reproduction and production in Murrah buffaloes. This gap in knowledge highlights the need for further scientific inquiry into the specific linear type traits that may influence the reproductive and productive aspects of Murrah buffaloes.

Ugur (2005) identified a noteworthy correlation between specific linear type traits and milk production in dairy animals. However, the existing literature on the association between skin thickness and milk production has yielded conflicting reports. While research has been conducted on cattle and their crossbred counterparts, there is a paucity of literature addressing the relationship between external body structure and milk production in buffaloes. Consequently, the present study was initiated to examine the phenotypic trait variability of Murrah buffaloes in conjunction with their milking traits.

2. METHODOLOGY

Murrah buffaloes (100) in first to third parity that were in the early stage of lactation (30–60 days in milk) were selected and kept under uniform management conditions at Buffalo Farm, Lala Lajpat Rai University of Veterinary and Animal Science, Hisar. 49 buffaloes were in the first lactation, 30 buffaloes were in the second lactation and 21 buffaloes were in the third lactation and were recorded for 11 body morphometric traits. Measurements of the body part viz. muzzle width over nasal septum, brisket width, skin thinness (Vernier caliper), and hip width were made with the help of a measuring scale. 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 a let-down of milk. The milking was performed by a full-hand method using both hands from the beginning of milking till the end of stripping.

2.6 Statistical analysis

The average of the treatment group was subjected to statistical procedures as outlined by Snedecor and Cochran, (1994).

3. RESULTS AND DISCUSSION

In the investigation, various morphometric traits were systematically measured, including muzzle width over the nasal septum, brisket width, skin thinness assessed using a Vernier caliper, and hip width. The detailed results of these measurements are provided in Table 1.

Table no.1 Correlation between lactation yield and body measurements in Murrah buffaloes

Lactation order	Body Measurements			
	MUZZLE	BRISKET	SKIN THIC.	HIP WIDT.

Lactation-I	-0.149	-0.162	0.291	-0.135
Lactation-II	-0.079	-0.109	0.364	0.173
Lactation-III	-0.198	-0.355	0.190	-0.046

The analysis of correlations between first, second, and third lactation milk yield in a sample comprising 49 buffaloes, 30 buffaloes, and 21 buffaloes, respectively, and multiple body measurements has yielded significant findings. Notably, a positive correlation was identified between the skin thickness of the buffaloes and their milk production across the first, second, and third lactation cycles. Conversely, negative correlations were observed between brisket size, muzzle width, and hip girth, and milk yield during these respective lactation periods.

Moreover, it is notable that the correlation between skin thinness and milk production exhibited a more pronounced effect in the second lactation compared to the first, and this positive correlation persisted into the third lactation. These findings underscore the potential significance of skin thinness in influencing milk production across multiple lactation cycles in buffaloes.

Correlations between first lactation milk yield (49 buffaloes) and various body measurements revealed a positive association with skin thinness, while negative associations were observed with brisket size, muzzle width, and hip girth. Similarly, correlations with second lactation milk yield (30 buffaloes) indicated positive associations with skin thinness and hip width, alongside negative correlations with brisket size and muzzle width. Notably, the correlation coefficient for skin thinness was higher in the second lactation compared to the first. Correspondingly, correlations between third lactation yield (21 buffaloes) and body measurements demonstrated a positive association with skin thinness and negative associations with brisket size, muzzle width, and hip width. In conclusion, the consistent positive correlation observed between skin thinness and milk production across the first, second, and third lactation cycles suggests a potential role of skin thinness as a contributing factor to milk production in buffaloes.

The 305-day lactation yield demonstrated a positive and statistically significant correlation with live weight, as well as with various physical traits, as reported by Agasti *et al.* (1984). In the current study, a positive correlation was observed between lactation yield and skin thinness. Buffaloes with thin skin exhibited higher milk production compared to those with medium skin thickness, potentially attributed to enhanced heat dissipation in animals with thinner skin, rendering them more efficient in milk production, especially in warmer climates (Bhatnagar and Chaudhary, 1960).

These findings align with the observations of Dhillod *et al.* (2017), who reported a significant negative correlation ($p < 0.01$) between milk yield and skin thickness (-0.79). Barati *et al.* (2017) noted negative correlations between daily milk yield and skin thickness in various regions, including the flank and udder, with significant associations. Kshatriya *et al.* (2009) similarly identified significant negative correlations between skin thickness at the neck, chest, and flank regions with milk yield in both indigenous and crossbred cattle. Notably, Desai and Sharma (1962) reported positive and significant correlations between skin thickness with milk yield in Haryana cattle, contrasting with the present study.

The current results also differ from those of Dahiya *et al.* (2020), who found that first lactation milk yield exhibited the highest correlation with hip bone distance (0.52) followed by top wedge angle (0.42), suggesting the potential use of these morphometric measurements for predicting first lactation milk yield in Murrah buffaloes at an early age.

In the present study, second lactation milk yield showed positive correlations with hip width and skin thinness but negative correlations with brisket size and muzzle width. These findings emphasize the significant correlation between morphometric traits, particularly skin thinness, and lactation yield in Murrah buffaloes.

4. CONCLUSION

In summary, a notable discovery from the current investigation is the identification of negative correlations between brisket width, muzzle width, and hip width with both first and third lactation milk yield in Murrah buffaloes. Conversely, certain parameters, specifically skin thinness at the neck region, exhibited positive correlations with all three lactation yields. Additionally, a positive correlation was observed between hip girth and second lactation yield. Consequently, these two traits, namely skin thinness at the neck region and hip girth, hold potential as selection indicators for identifying high-producing Murrah buffaloes under field conditions, particularly in the absence of specific milk production records. However, further research is warranted to delve into these relationships comprehensively, facilitating informed selection practices based on these identified morphometric traits.

REFERENCES

1. 20th Livestock Census All India Report, DAHD&F. Ministry of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India. 2019. www.dahd.nic.in.
2. Agasti MK, Choudhary G, Dhar NL. Genetic studies on some of the physical traits of Jersey X Hariana and Holstein X Hariana cross-bred cows. *Indian Veterinary Journal (India)*. 1984.
3. Atkins G, Shannon J. Minimizing lameness through genetic selection. *Advances in Dairy Technology*. 2002;14:93-109.
4. Bharadwaj A, Dixit VB, Seth RK, Khanna S. Association of breed characteristics with milk production in Murrah buffaloes. 2007;77:1011-1016.
5. Bhatnagar DS, Chaudhary NC. Relationship between milk production and certain body measurements in Murrah buffaloes. *Current Science*. 1960;29(5):193-94.
6. Bhatnagar DS, Kumar S. Skin thickness in relation to milk production in Sahiwal cows and their crosses with Brown Swiss. *Indian Journal of Dairy Science*. 1980;33(1):91-4.
7. Charlini BC, Sinniah J. Performance of Murrah, Surti, Nili-Ravi buffaloes and their crosses in the intermediate zone of Sri Lanka. *Development*. 2015;27(3):1-7.
8. Dahiya, S. P., Kumar, M., & Dhillod, S. (2020). Relationship of linear type traits with production and reproduction performance in Murrah buffaloes. *Indian Journal of Animal Sciences* 2020, 90(6), 942-946.
9. Desai RN, Sharma MD. Relationship between physical characters and milk yield in Haryana cattle. *Indian Veterinary Journal*. 1962;39:72-7.
10. Dhillod S, Kar D, Patil CS, Sahu S, Singh N. Study of the dairy characters of lactating Murrah buffaloes on the basis of body parts measurements. *Veterinary world*. 2017;10(1):17.
11. Esteves AM, Bergmann JA, Durães MC, Costa CN, Silva HM. Genetic and phenotypic correlations between type traits and milk production in Holstein cattle. *Arquivo Brasileiro de Medicina Veterinária e Zootecnia*. 2004;56:529-35.
12. Kshatriya PS, Trivedi MM, Dhami AJ. Association of udder biometry and skin thickness with milk yield in Kankrej and Crossbred cows. *The Indian Journal of Field Veterinarians*. 2009;5(1):11-3.
13. Renno FP, Araújo CV, Pereira JC, Freitas MS, Torres RD, Rennó LN, Azevêdo JA, Kaiser FD. Genetic and phenotypic correlations among type traits and milk yield of Brown Swiss cattle in Brazil. *Revista Brasileira de Zootecnia*. 2003;32:1419-30.
14. Schneider MD, Durr JW, Cue RI, Monardes HG. Impact of Type Traits on Functional Herd Life of Quebec Holsteins Assessed by Survival Analysis. *Journal of Dairy Science*. 2003;86(12):4083-9.
15. Snedecor GW, Cochran WG. *Statistical analysis*. Iowa State University Press, Ames. 1994.
16. Ugr F. Relationships between body measurement of dairy calves at six month of ages and age at first calving and milk production. *Journal of Central European Agriculture*. 2005;6(2):191-4.
17. Zavadilová L, Stipkova M. Genetic correlations between longevity and conformation traits in the Czech Holstein population. *Czech Journal of Animal Science* 2012;57(3):125-36.