Uttar Pradesh Journal of Zoology

Volume 45, Issue 13, Page 419-423, 2024; Article no.UPJOZ.3654
ISSN: 0256-971X (P)

Effect of Non-genetic Factors on Udder Biometry of Indigenous Cattle of Arunachal Pradesh, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.56557/upjoz/2024/v45i134170

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.mbimph.com/review-history/3654

Original Research Article

Received: 12/04/2024
Accepted: 16/06/2024
Published: 19/06/2024

ABSTRACT

The study was undertaken to estimate the effect non-genetic factors on the udder biometry of indigenous cattle of Arunachal Pradesh. A total of 158 indigenous cows were utilized to study the effect of location and lactation order on udder characteristics. Length of udder (LU), width of udder (WU), depth of udder (DU), teat length (TeL) and teat diameter (TeD) were included in the present

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***Cite as**: Kakki, Marpi, Galib Uz Zaman, Farzin Akhtar, Arpana Das, Bula Das, and Arundhati Phookan. 2024. "Effect of Non-Genetic Factors on Udder Biometry of Indigenous Cattle of Arunachal Pradesh, India". UTTAR PRADESH JOURNAL OF ZOOLOGY 45 (13):419-23. https://doi.org/10.56557/upjoz/2024/v45i134170.*

investigation. The data on udder measurement were classified according to location and lactation order of the animal. The means for LU, WU, DU, TeL and TeD were 30.940 ± 0.105, 21.506 ± 0.069, 9.923 ± 0.037, 4.459 ± 0.024, and 2.762 ± 0.025 cm respectively. Location and lactation order had significant effect on all the udder measurement traits. Existence of significant effect of this non-genetic factor indicates that these factors should be taken care of while estimating the genetic parameters for udder characteristics of indigenous cattle of Arunachal Pradesh.

Keywords: Udder; teat; biometry; Arunachal Pradesh.

1. INTRODUCTION

"Arunachal Pradesh has 3.32 lakh indigenous and 0.07 lakh crossbred/exotic cattle which constitute nearly one-third of the total livestock resource of the state" [1]. "Indigenous cattle are the main source of milk production in the state and they are mostly distributed in the Lohit, Changlang, West Siang, East Siang and Lower Subansiri districts. During the year 2022-23 total milk production in the state was 45.54 thousand tonnes, 85.04 per cent of which was contributed by the indigenous cattle" [2].

The indigenous cattle of Arunachal Pradesh are well adapted in high altitude and can survive and reproduce in adverse climatic locations of Indo-China border areas. These native cattle play a vital role in uplifting the socio-economic livelihood and nutritional safety of the tribal farmers [3-5]. In spite of being an enormous contributor to the economy of the state, these indigenous cattle of Arunachal Pradesh have received very less attention from the scientific community or the policy planners. Udder and teat measurement traits are considered to be important breed descriptor and are often used for selection in dairy cattle. Thus, a well-planned study on these traits appears necessary in this context of developing future breeding strategies of this germplasm. Thus, the present study aims to identify the influence of non-genetic factors on udder characteristics of Indigenous cattle of Arunachal Pradesh.

2. MATERIALS AND METHODS

Data on udder measurement were obtained from 158 indigenous cows of Arunachal Pradesh. The cows were secured properly on a level floor for the accuracy of measurements. The udder and teat measurements(cm) viz., Length of udder (LU), width of udder (WU), depth of udder (DU), teat length (TeL) and teat diameter (TeD) were recorded just before commencing morning milking during the first stage of lactation (5^{th} day to 90^{th} day of lactation) as per method described by Rahman and Gill [6]. For teat length and teat diameter, all the four teats were measured separately. The data collected for udder measurement traits were classified according to Location viz., West Siang (D_1), Lohit (D_2) and West Kameng (D_3) and lactation order (L_1, L_2, and L_3) and were evaluated following least squares analysis of variance as suggested by Harvey [7]. Duncan's Multiple Range Test (DMRT) as modified by Krammer [8] was used to make all pair wise comparisons among the means wherever significant differences between levels of effect were obtained.

3. RESULTS AND DISCUSSION

The overall least-squares means for LU, WU, DU, TeL and TeD derived from 158 records of indigenous cattle of Arunachal Pradesh in the present investigation were obtained as 30.940 ± 0.105, 21.506 ± 0.069, 9.923 ± 0.037, 4.459 ± 0.024 and 2.762 ± 0.025 cm respectively. The present finding were in accordance with the report of Kayastha [9] who recorded the mean LU, WU, DU, TeL and TeD in Assam local cattle as 36.053 ± 0.221, 24.138 ± 0.309, 10.731 ± 0.184, 5.773 ± 0.042 and 2.239 ± 0.25 cm respectively. Comparable values for TeL was also reported by Terefe et al*.* [10] in Mursi cattle (5.2 ± 0.3 cm). The present findings on TeD of indigenous cattle of Arunachal Pradesh was supported well by Prajapati [11] in Kankrej cows (2.49 ± 0.05 cm), Gaur et al*.* [12] Gir cows (2.88 cm) and Singh et al*.* [13] in Vrindavani cows (2.10 ± 0.05 cm). However, longer mean LU, WU, DU and TeL were recorded in Gir cows by Qureshi et al*.* [14], Gaur et al*.* [10] and Modh et al. [15] and in Kankrej cows by Prajapati [11]. It is evident that that the LU, WU, DU and TeL obtained in the present investigation were relatively shorter than most of the recognized cattle breeds.

Table 1. Least-squares means and standard errors along for various factors affecting length of udder (LU), width of udder (WU), depth of udder (DU), teat length (TeL) and teat diameter (TeD) IN indigenous cattle of Arunachal Pradesh

Sub class description	N	LU (cm) LSM ± SE	WU (cm) LSM ± SE	DU (cm) LSM ± SE	TeL (cm) LSM ± SE	TeD (cm) LSM ± SE
μ	158	30.940 ± 0.105	21.506 ± 0.069	9.923 ± 0.037	4.459 ± 0.024	2.762 ± 0.025
Location						
D_1	46	30.462 ± 0.194^a	21.179 ± 0.128^a	9.696 ± 0.069^a	4.355 ± 0.045^a	2.559 ± 0.046^a
D_2	58	30.224 ± 0.174^a	21.368 ± 0.114^a	9.709 ± 0.062^a	4.387 ± 0.040^a	2.555 ± 0.041^a
D_3	54	32.134 ± 0.179^b	21.972 ± 0.118^b	10.366 ± 0.064^b	4.634 ± 0.041^b	3.171 ± 0.042^b
Lactation order						
L_1	50	28.437 ± 0.187^a	19.748 ± 0.123^a	9.152 ± 0.066^a	4.092 ± 0.043^a	2.574 ± 0.044^a
L_2	53	31.448 ± 0.181^b	21.292 ± 0.119^b	10.161 ± 0.064^b	4.130 ± 0.042^a	2.558 ± 0.043^a
L_3	55	32.935 ± 0.179^c	23.479 ± 0.118^c	10.458 ± 0.063^c	5.154 ± 0.041^b	3.154 ± 0.042^b

LSM: Least-squares means; SE: Standard error; N: Number of observations
Sub-class means with different superscripts differ significantly (P<0.05)

3.1 Effect of Location

The mean LU for the animal of West Siang, Lohit and West Kameng districts were found to be 30.462 ± 0.194, 30.224 ± 0.174 and 32.134 ± 0.179 cm respectively. Analysis of variance showed significant differences (P<0.01) among the three locations for LU, WU, DU TeL and TeD (Table 1). DMRT revealed that animals from West Kameng district had significantly higher mean for all the udder dimension traits under study than those of West Siang and Lohit district. Significant effect of location on LU and WU was reported by Kayastha [9] in Assam local cattle and Gajbhiye [16] in crossbred cattle. Moreover, significant effect of location on DU and TeL was reported by Khan and Khan [17] in Sahiwal cattle and Terefe et al. [10] in Mursi cattle respectively. However, non-significant effect of location on Du, TeL and TeD was reported by Kayastha [9] in Assam local cattle. Significantly higher values of udder dimension traits of cattle belong to West Kameng district indicates that selection based on higher values of udder dimension traits may enhances increase in milk yields as there is a favourable association between udder traits with milk production [18].

3.2 Effect of Lactation Order

Least-squares analysis of variance showed that LU, WU, DU, LeT and LeD were significantly affected by lactation order. In the present study all the traits under study were found to increase steadily with the increase in the lactation order of the animal, with the highest mean observed in the third lactation. The mean LU, WU, DU, LeT and LeD in the third lactation was found to be 32.935 ± 0.179, 23.479 ± 0.118, 10.458 ± 0.063, 5.154 ± 0.041 and 3.154 ± 0.042 cm respectively. Report suggesting significant effect of parity on the LU and WU was made by Prajapati [11] in Kankrej cows and Modh et al. [15] in Gir cows. Singh et al. [13] in Vrindavani cows and Patel et al. [19] in crossbred cows opined that parity was a significant source of variation in DU. However, non-significant effect of parity on TeL and TeD was reported by Kayastha [9] in Assam local cattle. From our study it was observed that there were gradual increases of udder measurements as the lactation advances and highest in third lactation in indigenous cattle of Arunachal Pradesh. This could be due higher bodyweight, maturity and aging of multiparous cows over primiparous cows [20].

4. CONCLUSION

From our study it was observed that there was significant effect of location and lactation order on udder measurement traits in indigenous cattle of Arunachal Pradesh. Hence these non-genetic factors shall be taken care of while estimating the genetic parameters for udder characteristics of indigenous cattle of Arunachal Pradesh. Besides, the finding of this study could be valuable insight and can be used as breed descriptor parameters to distinguish indigenous cattle of Arunachal Pradesh form other cattle breeds.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.mbimph.com/review-history/3654