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Effects of different stages of lactation on milk components of Murrah buffalo

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Abstract

The present study was conducted at dairy unit number 20, situated at Aarey milk colony, Goregaon, Mumbai and Department of Livestock Production and Management, Bombay Veterinary College, Mumbai. For the study 45 Murrah buffaloes were selected and they were divided into three equal groups of 15 each for early (0-90 days), mid (90-180 days) and late (180-270 days) lactation stage. From the results of experiment it was found that the fat percentage of milk yield showed significant difference amongst early and late and mid and late lactation respectively whereas non significant difference was observed between early and mid lactation stage. The protein percentage and lactose percentage in milk of Murrah buffaloes at different stages of lactation showed significant difference among the treatment groups.

Keywords: Murrah, lactation, fat, protein, lactose, parity

Introduction

Dairy is an emerging sector for income generation and employment opportunity in rural and semi urban areas in Maharashtra. The majority of the population being small and marginal farmers or landless labors practicing subsistence agriculture, animal husbandry in a scientific way substantially adds to economic activity of the area. Thus can prevent the farmers from committing suicide as per the ongoing crisis in the state and therefore government is promoting the animal husbandry sector as a substitute source of income on which the farmers can rely upon.

The total buffalo contributes about 21.23% of total livestock population. The total number of buffalo in the country as per 2012 census is 108.7 million number. Maharashtra contribute about 5.15% buffalo population in country Uttar Pradesh having largest population 28.17 in India. Rajasthan, Andhra Pradesh, Gujarat, Madhya Pradesh, Bihar, Haryana, Punjab and Karnataka states having buffalo population 11.94%, 9.77%, 9.55%, 7.53%, 6.96%, 5.60%, 4.75%, 3.19% (Anonymous 2012).

Milk composition is the outcome of various biological reactions, affected by feed intake and physiological status of animals. Physiological status, in turn, is affected by environment modulated through hypothalamus and pituitary. Physical, chemical and bacteriological characteristics of milk was determine its nutritional significance plus acceptability by consumers. Milk composition is the outcome of the flow of substrates from the blood circulation to the mammary tissues. Buffalo milk is extremely rich in calcium, and is a good source of minerals like magnesium, potassium, and phosphorus. It produces thick and creamy dairy products suitable for the manufacture of traditional milk products like yogurt and cottage cheese (called "paneer" in South Asia), as well as indigenous milk products like khoa and ghee. The buffalo milk contains more fat, solids not fat and total solids than cow.

Energy shortfall in early lactation enhances, but energy intake does not maintain pace with continuously increasing milk yield, creating a competitive situation among milk yield, milk composition and animal health of the dairy animal as all these traits are interlinked with energy. High-yielding herds usually get very limited dry period, suggesting that the drop in fertility can be compensated by proper management (Laben *et al.*, 1982; Nebel and McGilliard, 1993) ^[15].

Materials and Methods

The Murrah buffaloes were divided into three groups of fifteen each of third parity which were

depicted as 15 Murrah buffaloes in early lactation stage (0-90 days), 15 Murrah buffaloes in mid lactation stage (90-180 days) and 15 Murrah buffaloes in late lactation stage (180-270 days).

All the animals were fed as per their requirement and were given uniform conditions. Milking was done twice daily at 4 a.m. at morning and at 4 p.m. at evening hours. All animals were milked by full hand milking method followed by stripping to remove all milk from the udder of buffalo. The milking was finished in 5 to 7 minutes in clean and sanitary conditions. Hygienic practices were strictly followed on farm to avoid contamination of milk

Milk Component Analysis

Milk samples were collected fortnightly from farm at the time of milking in the milk sampling bottles after proper mixing of milk in bucket of each animal separately. Milk fat, protein and lactose percentage were estimated by using auto-analyzer (lacto-scan) available at Department of Livestock Production and Management BVC, Mumbai.

Statistical Analysis

The data regarding the present study was analyzed by Completely Randomized Design (WASP 2.0)

Results and Discussion

1. Fat Percentage

The milk composition is the result of various biological processes affected by feed intake and physiological status of the animal. The physiological status of the animal is affected by environmental parameters regulated through hypothalamus and pituitary. The fat percentage is one of the important factor as far as the quality of milk is concerned. Normally the pricing of milk is based on the fat percentage of milk. The fat percentage of milk of Murrah buffalo is presented in table 1 and depicted in fig.1.2 and 3. The fat percentage of milk of Murrah buffalo at different stages ie. Early mid and lactation were $6.83 \pm 0.167\%$, $7.21 \pm 0.202\%$ and $8.31 \pm 0.060\%$ respectively. The highest milk fat % was recorded at late lactation, whereas lowest milk fat% was record at early lactation. The changes in milk fat percentage may have been partially due to the dilution and subsequent concentration of milk fat as milk volume rose and fell during lactation. The changes in energy balance that occurs throughout the lactation would have been important in determining the extent of variation of these components. During early lactation the buffaloes would have been in negative energy balance with the precursors for the synthesis of milk fat needed for meeting energy requirement. As the lactation proceeded and the the milk yield decreased. Energy balance would have been improved. Statistically fat percentage of milk yield showed

Fat percentage

Table 1: Fat percentage of Murrah buffalo milk during different stages of lactation.

Days of experiment	Fat (%)		
	Early Lactation (0-90 days)	Mid Lactation (90-180 days)	Late Lactation (180-270 days)
15	7.42	6.58	8.11
30	7.21	6.80	8.16
45	6.34	7.23	8.30
60	6.56	7.24	8.40
75	6.66	7.43	8.43
90	6.80	7.99	8.46
AVG \pm SE	$6.83^b \pm 0.167$	$7.21^b \pm 0.202$	$8.31^a \pm 0.060$

significant difference amongst early and late and mid and late lactation respectively whereas non significant difference was observed between early and mid lactation stage. These findings were in close agreement as these reported by Rossi et al., (1997) [20] Catillo et al. (2002) [5], and Cero'n-Mun~ oz, et al. (2002) [6], Mushtaq et al., (2010) [13], Mushtaq A., et al., (2012) [14], Yadav et al. (2013) [22], Singh et al., (2015), and in contrast with those reported by Aspilueta-Borquis et al. (2010) [1] and Mouffok et al., (2013) [12].

2. Protein Percentage

The protein percentage in milk of Murrah buffaloes at different stages of lactation ie. early mid and late were $3.24 \pm 0.062\%$, $3.45 \pm 0.035\%$ and $4.00 \pm 0.055\%$ respectively. Presented in table 2 and depicted in fig.4,5 and 6. The protein percentage was lowest in early and subsequently it increased gradually and was highest in late lactation probably due to influx of plasma proteins between alveolar cells of the degenerating mammary epithelia (Donnelly and Berry 1983) Similar finding were reported by Ng-kwai-hang et al.(1982) [16], Rossi et al.,(1997) [20], Catillo et al.(2002) [5], Cero'n-Mun~ oz, et al. (2002) [6], Mushtaq et al., (2010) [13], Aspilueta-Borquis et al. (2010) [1] and Mushtaq A., et al., (2012) [14]. and the contrasting finding were reported by Berry et al., (2007) and Yadav et al. (2013) [22] Statistically the protein percentage in milk of murrah buffaloes at different stages of lactation showed significant difference among the treatment groups.

3. Lactose Percentage

The lactose percentage in milk of Murrah buffaloes at different stages of lactation ie. Early, mid and late lactation are presented in table 3 and depicted in fig.7, 8 and 9. Were $5.46 \pm 0.029\%$, $5.27 \pm 0.016\%$ and $5.11 \pm 0.015\%$ for early, mid and late lactation stage respectively the lactose percentage was highest at early lactation and lowest at late lactation. The highest lactose percentage at early lactation would probably due to an increase in the synthesis by the mammary epithelial cells at lactogenesis and thereafter the overall percentage of lactose declines as lactation progressed, this may attributed partly to the degeneration of secretory cells as involution approached and partly to the escape of lactose in to the blood through the para cellular pathways that proliferates at this time (Sordilla and Nickerson 1988) The similar finding were reported by Mushtaq et al., (2010) [13], Mushtaq et al., (2012) [14] and Yadav et al. (2013.) [22] where as contrasting finding was reported by Cero'nMun~ oz, et al. (2002) [6]. The lactose percentage of milk of Murrah buffaloes at different stages of lactation showed significant difference among treatment groups.

Table 2: Protein percentage of Murrah buffalo milk during different stages of lactation

Days of Experiment	Protein (%)		
	Early Lactation (0-90 days)	Mid Lactation (90-180 days)	Late Lactation (180-270 days)
15	3.45	3.33	3.64
30	3.39	3.39	3.70
45	3.10	3.45	3.78
60	3.09	3.47	3.84
75	3.16	3.51	3.92
90	3.26	3.57	4.00
AVG ± SE	3.24 ^c ± 0.062	3.45 ^b ± 0.035	4.00 ^a ± 0.055

Table 3: Lactose percentage of Murrah buffalo milk during different stages of lactation.

Days of experiment	Lactose (%)		
	Early Lactation (0-90 days)	Mid Lactation (90-180 days)	Late Lactation (180-270 days)
15	5.37	5.33	5.18
30	5.40	5.30	5.13
45	5.44	5.28	5.10
60	5.47	5.27	5.10
75	5.52	5.24	5.09
90	5.56	5.22	5.09
AVG ± SE	5.46 ^a ± 0.029	5.27 ^b ± 0.016	5.11 ^c ± 0.015

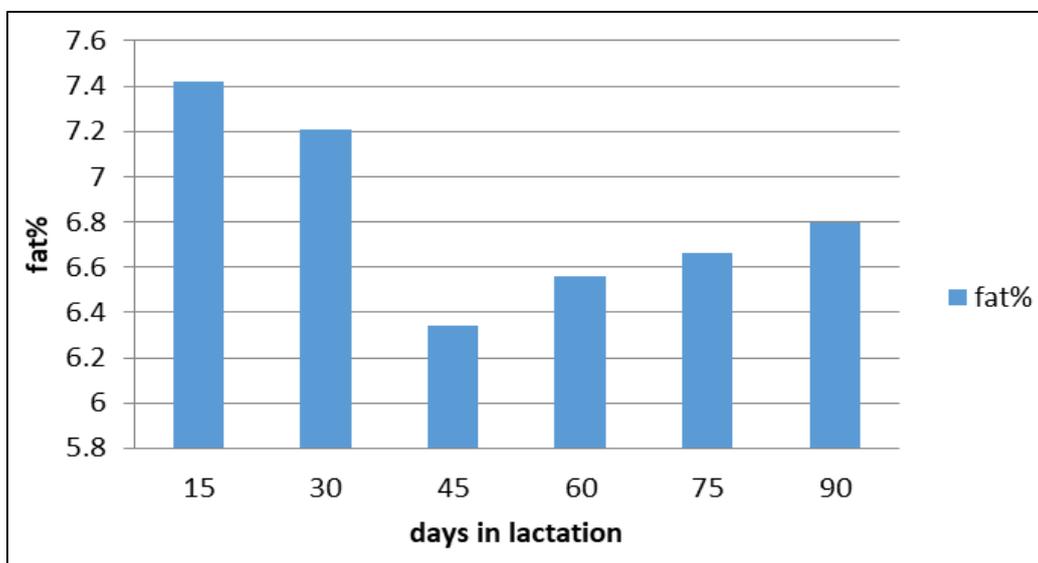


Fig 1: Fat percentage of Murrah buffalo milk during early stage of lactation

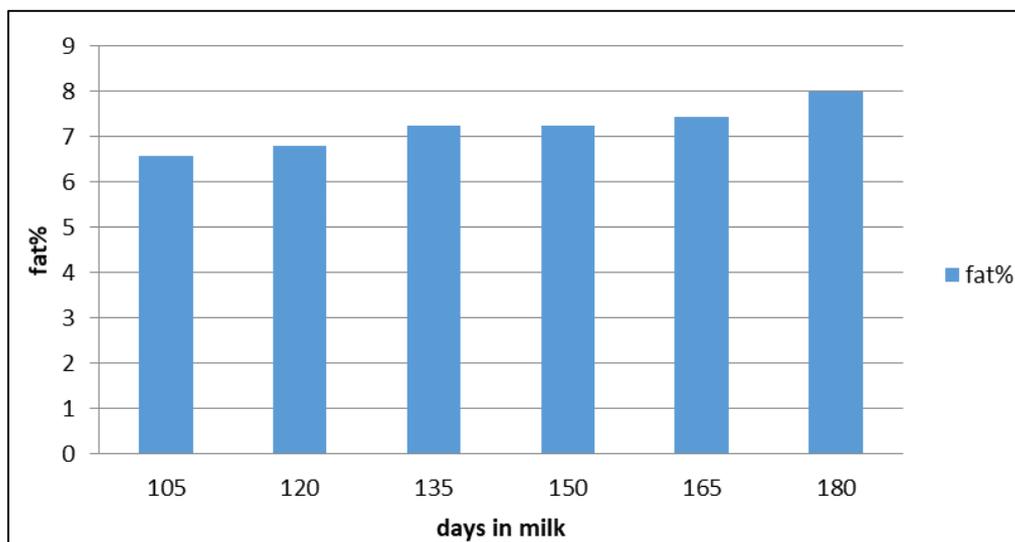


Fig 2: Fat percentage of Murrah buffalo milk during mid stage of lactation

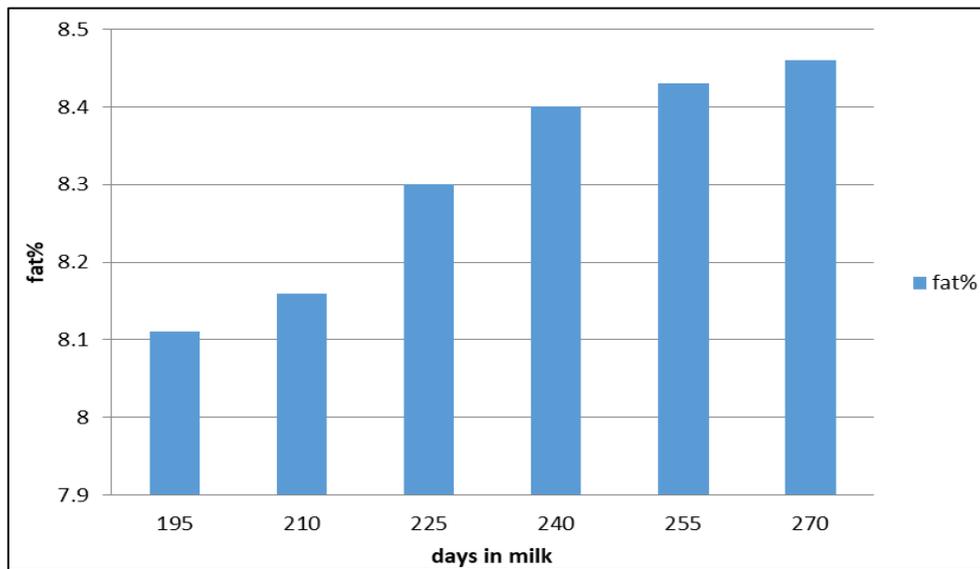


Fig 3: Fat percentage of Murrah buffalo milk during late stage of lactation

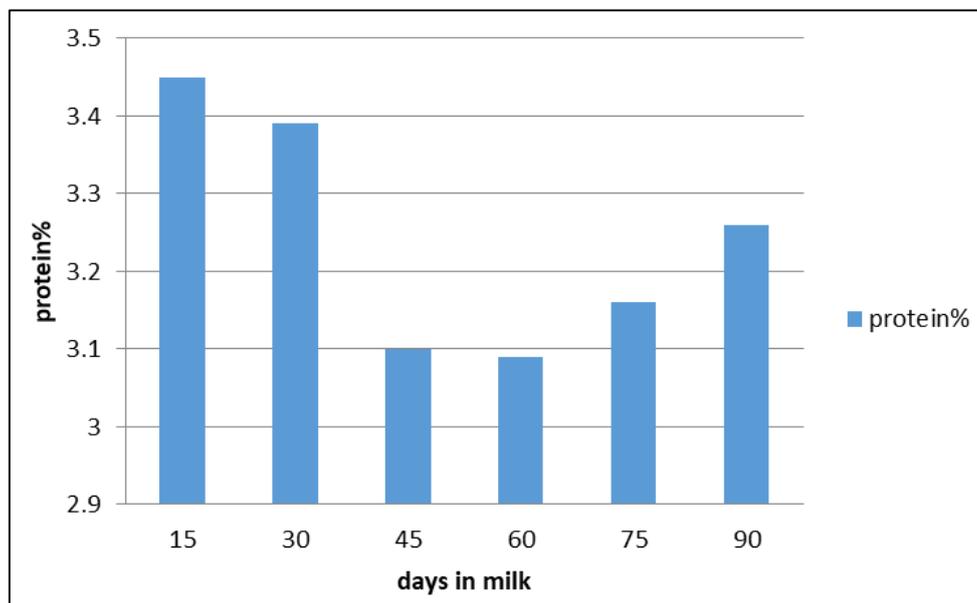


Fig 4: Protein percentage of Murrah buffalo milk during early stage of lactation.

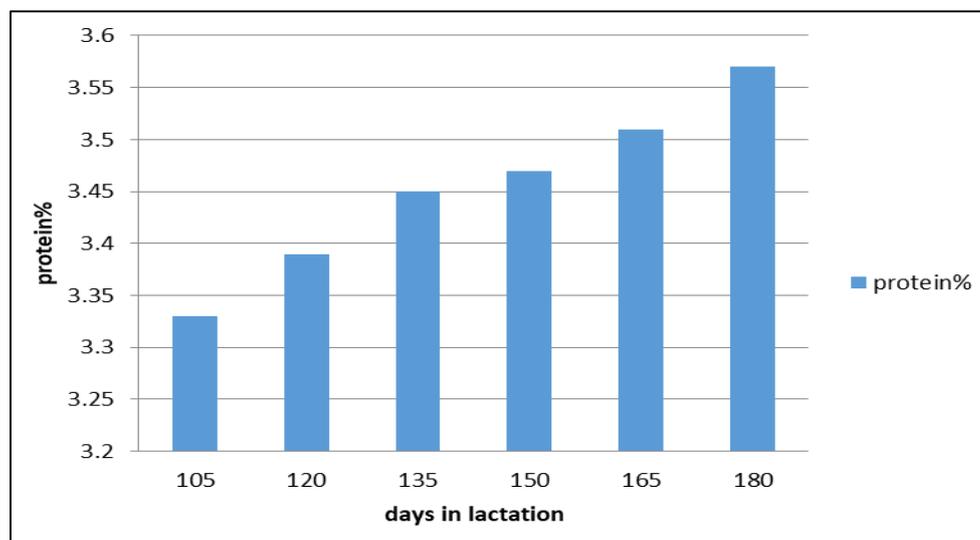


Fig 5: Protein percentage of Murrah buffalo milk during mid stage of lactation

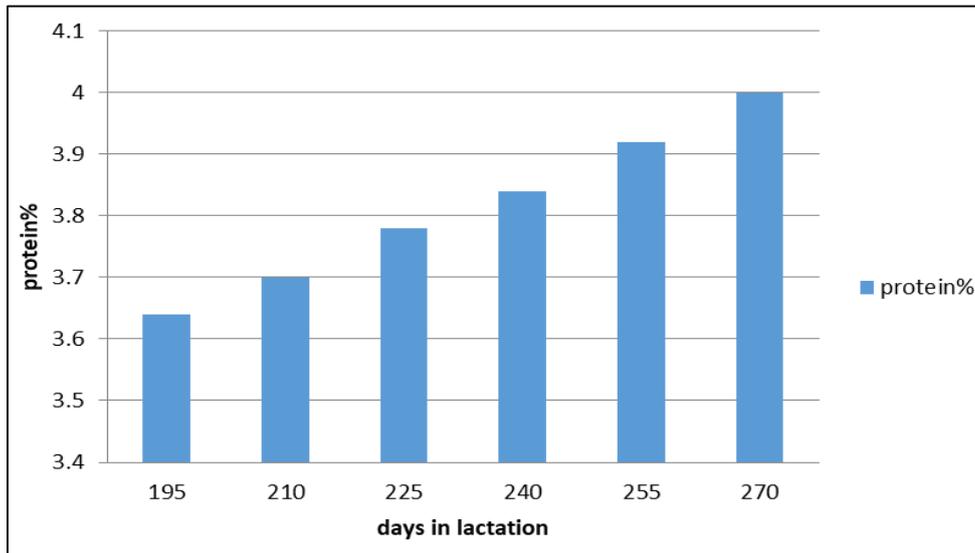


Fig 6: Protein percentage of Murrah buffalo milk during late stage of lactation

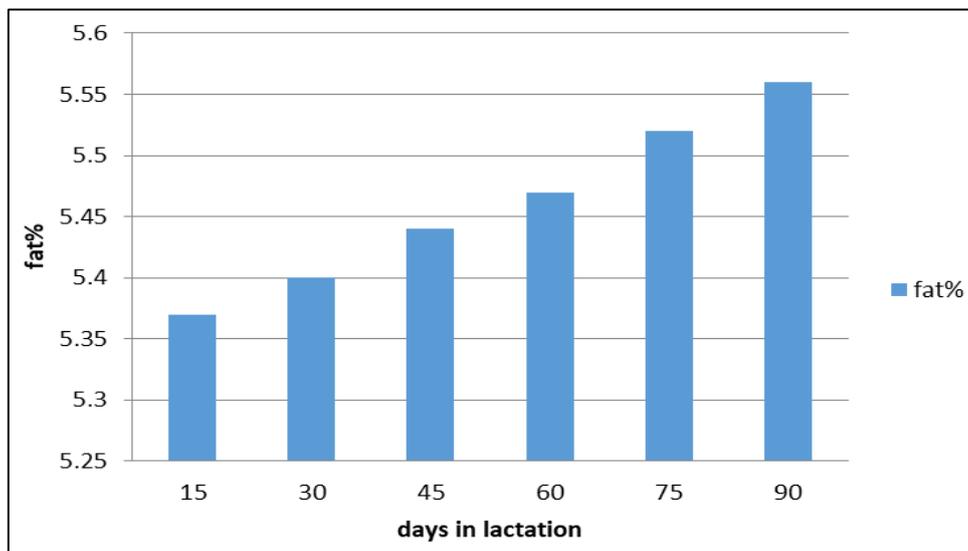


Fig 7: Lactose percentage of Murrah buffalo milk during early stage of lactation

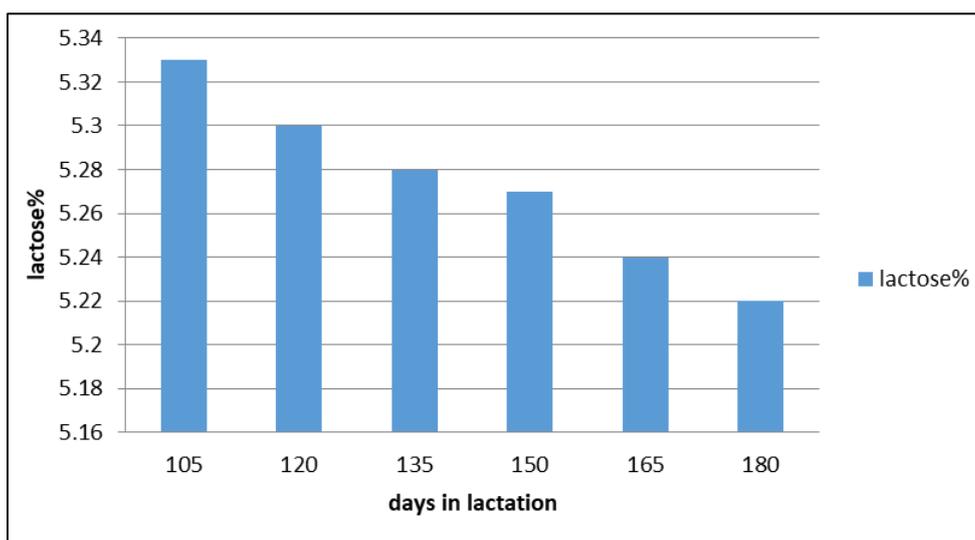


Fig 8: Lactose percentage of Murrah buffalo milk during mid stage of lactation

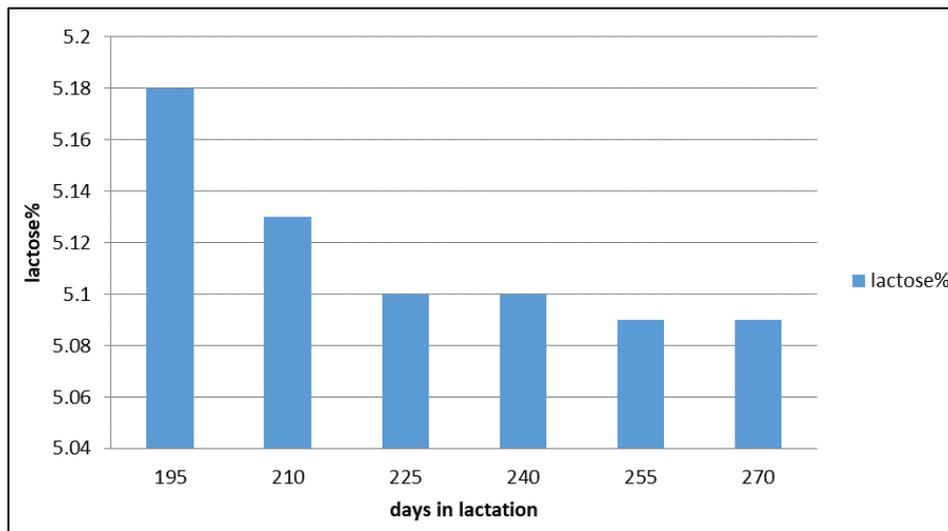


Fig 9: Lactose percentage of Murrah buffalo milk during late stage of lactation.

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