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Research Article

EFFECTS OF ARTIFICIAL REARING OF SURTI BUFFALO CALVES ON MILK YIELD, COMPOSITION, SOMATIC CELL COUNT AND POSTPARTUM OESTRUS INTERVAL IN SURTI BUFFALOES

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Abstract- The present investigation was conducted on twenty-four Surti buffaloes and their calves maintained at Livestock Research Station, Navsari Agricultural University, Navsari with the objective to study the effects of artificial rearing of Surti buffalo calves on milk yield, composition, somatic cell count and postpartum oestrus interval in Surti buffaloes. Calves were weaned on the day 6 after calving and were raised under natural suckling method where they were allowed to suckle their dam before and after milking whereas calves raised artificially were maintained on whole milk (T_1) and milk replacer (T_2) fed through milk feeding bottle for first 90 days of their life. Calves and their mother were raised under loose housing and group management systems. Perusal of data revealed that a non-significant difference in milk yield was found among the three groups at all test days. Milk protein (%) of T_1 group was significantly higher than control group of animals on the day 6. There was significant difference ($p<0.05$) in milk fat (%) between T_1 (6.83±0.17 %) andT_2 (6.13±0.24 %) group on day 76 and between control (7.06±0.18 %) and T_2 (6.23±0.27 %) group at day 90 of the study. T_1 group of buffaloes had significantly ($p<0.05$) lower SNF (9.80±0.28 %) than control (10.46±0.19%) and T_2 (10.63±0.18 %) group of animals at day 20. There was non-significant difference in the milk lactose (%) among three groups of buffaloes. A non-significant difference was observed ($p<0.05$) in the somatic cell count (SCC) among three groups of animals. The post-partum estrus interval was comparatively lower in artificially reared than natural suckling group of Surti buffaloes.

Keywords- Natural suckling, Artificial rearing, Surti buffalo Calves, Somatic cell count (SCC) and Postpartum estrous interval.

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Introduction

Riverine buffalo (*Bubalus bubalis*) is the backbone of the Indian dairy industry as it has contributed around fifty percent of the total milk produced in the country over the years [1]. In the year of 2012-13, total milk production in India was about 132.3milliontonnes, out of which about 67.67 million tonnes were contributed by the buffaloes [2]. Due to technological advancement and availability of the milk substitutes has led to the artificial rearing of calves [3]. However, in developing countries, generally traditional milking system is followed where calves can suckle the dam just before (to stimulate milk let-down) and after milking to suckle the residual milk and sometimes the milk in one un-milked quarter [4,5]. This system doesn't allow full utilization of milk production potential of buffaloes for the market. Limited suckling is known to influence saleable and total milk yield [6] udder health [7,8], milk composition [9,10]and delayed postpartum resumption of ovarian activity [11-13]. Therefore, present study was proposed with the objective to study the effects of artificial rearing of Surti buffalo calves on milk yield, composition, somatic cell count and postpartum oestrus interval in Surti buffaloes.

Material and Methods

The present investigation was conducted on twenty-four Surti buffaloes and their calves maintained at Livestock Research Station, Navsari Agricultural University, Navsari. Total duration of study was 90 days. Calves were weaned on the day 6 after calving and were assigned to one of the three groups:(1) Control: Calves of control group were allowed to suckle their dam before milking for 1 minute (to facilitate milk let down) and after milking till the calves leave udder willingly.(2) Treatment 1: T_1 group of calves were allowed to suckle their dams only before milking for 1 minute and then were fed remaining amount of the milk through bottle till 90th day postpartum. (3) Treatment 2: T_2 group of calves were also allowed to suckle their dams only before milking for 1 minute and then remaining amount of the milk was replaced with milk replacer (125 gm of milk replacer was dissolved in 875 ml of water which was equivalent to 1 liter of milk) and it was fed through bottle till 90th day postpartum. Feeding was carried out using bottle with rubber nipple. After one month of age all group were provided 200 gm of concentrate mixture and *ad lib* amount of green fodder. After two months of age their concentrate allowance was increased up to 250 gm daily. Besides various essential minerals and vitamins, milk replacer had protein-20%, fat-15%, crude fiber-5% whereas concentrate mixture had crude protein-18.27%, ether extract-3.07%, crude fiber-12.18%, calcium and phosphorus. All buffaloes were managed under loose housing and group management system. Apart from the difference in rearing i.e. natural suckling and artificial rearing of their calves all other management practices were similar for all buffaloes. They were hand milked twice daily. Milk yield and composition were recorded starting from 6th day postpartum till 90thday postpartum at fortnight interval. The milk yield of the individual buffalo was recorded by electronic weighing balance while percent Fat, Solid Not Fat, Total solids, and Somatic cell count (SCC) were estimated on the same test days.

Number of days after calving Surti buffaloes showed signs of estrus were recorded from breeding register maintained at this farm. The collected data were compiled, tabulated, and analyzed by using SAS 9.3. Statistical analysis of other parameters was carried out by using fixed least square model LSML package [14]. Significant differences between means were tested by one-way ANOVA.

Result and Discussion

Productive performance of dam

Milk yield: The least squares' means of milk yield of control, T_1 and T_2 groups of Surti buffaloes at fortnight interval have been depicted in [Table-1]. A non-significant difference in milk yield was found among the three groups at all test days. However, least squares' means of daily milk yield of T_1 and T_2 group were slightly higher than control group at most of the test days. It might be due to complete milk let down in dam by suckling stimuli of calves and complete emptying of udder by milkers in treatment groups whereas calves suckled willingly variable amount of milk resulting in incomplete emptying of udder in control group. There was higher saleable milk yield produced from dam of T_1 and T_2 group than control group of Surti buffalo calves which are in agreement with [6,9,10,15-19]. Milk yield of Control, T_1& T_2 groups of Surti buffalo calves at different stage of lactation are presented in [Fig-1].

Table-1 *Least squares' means and standard error (LSM ± SE) of milk yield of Surti buffaloes at fortnight interval*

Milk yield (kg/day)							
Group	6th day	20th day	34th day	48th day	62nd day	76th day	90th day
C	2.05±0.43 (8)	3.17±0.39 (8)	3.47±0.34 (8)	3.60±0.37 (8)	3.60±0.47 (8)	3.86±0.43 (8)	3.75±0.42 (8)
T_1	2.14±0.62 (8)	4.12±0.34 (8)	3.86±0.31 (8)	4.36±0.31 (8)	3.94±0.26 (8)	4.17±0.22 (8)	4.06±0.18 (8)
T_2	3.15±0.34 (8)	4.10±0.29 (8)	3.90±0.25 (8)	3.92±0.44 (8)	4.11±0.31 (8)	4.02±0.19 (8)	3.62±0.34 (8)
Overall	2.44±0.28 (24)	3.80±0.21 (24)	3.74±0.17 (24)	3.96±0.22 (24)	3.88±0.20 (24)	4.02±0.17 (24)	3.81±0.18 (24)
Figures in parentheses are the members of animals used to derive LSM.							

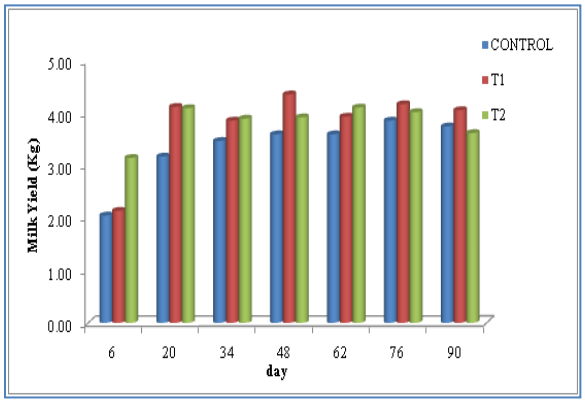

Fig-1 Milk yield of Control, T_1& T_2 groups of Surti buffalo calves at different stage of lactation

Milk composition

Milk Protein (%): The least squares' means of milk protein (%) of control, T_1 and T_2 groups of Surti buffalo at different days of age have been depicted in [Table-2]. Milk protein (%) of T_1 group was significantly higher than control group of animals on day 6. Further there was no definite trend was observed in this parameter at different test days.

Milk fat (%): The least squares' means of milk fat (%) of control, T_1 and T_2 groups of Surti buffalo at different days of age have been depicted in [Table-3]. There was significant difference ($P<0.05$) in milk fat (%) between T_1 (6.83±0.17 %) andT_2 (6.13±0.24 %) group on day 76 and between control (7.06±0.18 %) and T_2 (6.23±0.27 %) group at day 90 of the study.

Milk SNF (%): The least squares' means of milk SNF (%) of control, T_1 and T_2 groups of Surti buffaloes at different days of age have been depicted in [Table-4]. T_1 group of buffaloes had significantly ($p<0.05$) lower SNF (9.80±0.28 %) than control (10.46±0.19%) and T_2 (10.63±0.18 %) group of animals at day 20 of age..

Table-2 *Least squares' means and standard error (LSM ± SE) of milk protein of Surti buffaloes at fortnight interval*

Group	Protein (%)						
	6th day	20th day	34th day	48th day	62nd day	76th day	90th day
C	3.50±0.06^{b} (8)	3.61±0.10 (8)	3.67±0.18 (8)	3.77±0.16 (8)	3.90±0.15 (8)	3.75±0.19 (8)	3.69±0.12 (8)
T_1	3.83±0.12^{a} (8)	3.63±0.08 (8)	3.41±0.09 (8)	3.89±0.20 (8)	4.05±0.23 (8)	4.22±0.17 (8)	3.85±0.15 (8)
T_2	3.65±0.07^{ab} (8)	3.80±0.16 (8)	3.48±0.10 (8)	3.53±0.07 (7)	3.72±0.07 (8)	3.92±0.17 (8)	3.98±0.34 (8)
Overall	3.66±0.05 (24)	3.68±0.08 (24)	3.52±0.07 (24)	3.74±0.09 (23)	3.89±0.09 (24)	3.96±0.11 (24)	3.84±0.13 (24)
Figures in parentheses are the members of animals used to derive LSM.							

Table-3 *Least squares' means and standard error (LSM ± SE) of milk fat of Surti buffaloes at fortnight interval*

Group	Fat (%)						
	6th day	20th day	34th day	48th day	62nd day	76th day	90th day
C	5.46±0.37 (8)	5.03±0.50 (8)	5.42±0.37 (8)	6.49±0.15 (8)	6.71±0.15 (8)	6.84±0.22^{a} (8)	7.06±0.18^{a} (8)
T_1	5.77±0.21 (8)	5.27±0.38 (8)	5.50±0.38 (8)	6.34±0.16 (8)	6.60±0.16 (8)	6.83±0.17^{a} (8)	6.79±0.24^{ab} (8)
T_2	5.24±0.35 (8)	6.12±0.52 (8)	5.94±0.40 (8)	6.03±0.20 (8)	6.12±0.29 (8)	6.13±0.24^{b} (8)	6.23±0.27^{b} (8)
Overall	5.49±0.18 (24)	5.47±0.28 (24)	5.62±0.22 (24)	6.28±0.10 (24)	6.48±0.13 (24)	6.60±0.14 (24)	6.69±0.15 (24)
LSM showing different superscripts in lower case letters in a column differ significantly at P<0.05. Figures in parentheses are the members of animals used to derive LSM.							

Table-4 *Least squares' means and standard error (LSM ± SE) of SNF of Surti buffaloes at fortnight interval*

Group	SNF (%)						
	6th day	20th day	34th day	48th day	62nd day	76th day	90th day
C	9.46±0.13 (8)	10.46±0.19 [a] (8)	10.59±0.45 (8)	11.34±0.38 (8)	11.36±0.36 (7)	11.11±0.23 (8)	10.86±0.22 (8)
T_1	9.58±0.23 (8)	9.80±0.28[b] (8)	10.36±0.38 (8)	11.18±0.27 (8)	11.94±0.28 (8)	10.94±0.60 (8)	11.59±0.43 (8)
T_2	9.91±0.22 (8)	10.63±0.18[a] (8)	11.11±0.29 (8)	11.72±0.43 (8)	11.11±0.22 (8)	10.93±0.36 (8)	11.27±0.33 (8)
Overall	9.65±0.12 (24)	10.30±0.14 (24)	10.69±0.22 (24)	11.41±0.21 (24)	11.47±0.17 (23)	10.99±0.23 (24)	11.24±0.20 (24)

LSM showing different superscripts in lower case letters in a column differ significantly at P<0.05.
Figures in parentheses are the members of animals used to derive LSM.

Table-5 *Least squares' means and standard error (LSM ± SE) of lactose of Surti buffaloes at fortnight interval*

Group	Lactose (%)						
	6th day	20th day	34th day	48th day	62nd day	76th day	90th day
C	4.93±0.12 (8)	5.25±0.10 (8)	5.20±0.14 (8)	5.32±0.11 (8)	5.37±0.15 (8)	5.06±0.14 (8)	5.45±0.13 (8)
T_1	5.05±0.11 (8)	5.58±0.58 (8)	5.39±0.10 (8)	5.35±0.06 (8)	5.49±0.24 (8)	5.41±0.11 (8)	5.52±0.09 (8)
T_2	5.13±0.15 (8)	5.36±0.17 (8)	5.62±0.40 (8)	5.66±0.34 (8)	5.60±0.27 (8)	5.60±0.28 (8)	5.44±0.30 (8)
Overall	5.04±0.07 (24)	5.40±0.20 (24)	5.40±0.14 (24)	5.44±0.12 (24)	5.49±0.13 (24)	5.36±0.12 (24)	5.47±0.11 (24)

Figures in parentheses are the members of animals used to derive LSM.

Milk Lactose (%): The least squares' means of milk lactose (%) of control, T_1 and T_2 groups of Surti buffalo at different days of age have been depicted in [Table-5]. There was non-significant difference in the milk lactose (%) among three groups of buffaloes at different test days.

There was almost higher milk fat % and lower milk SNF% in T_1 and T_2 group than control group of buffaloes which are contradictory to the result reported by [9, 19, 20] and opposed by [18]. Fat % is also higher in T_1 and T_2 group up to 48 days fetch more sale price to producers. Higher fat % in the T_1 and T_2 group of animals might be due to complete emptying of udder at the time of milking.

Milk Somatic Cell Count (SCC): We observed a non-significant difference in the somatic cell count among three groups of animals at different test days. In present study somatic cell count was observed within normal range (< 250000/ml) of buffalo [21-23].

Postpartum interval to estrus: We have combined the data of both the treatment groups because in these two groups only partial/restricted suckling was allowed where as in control group normal suckling was allowed for calves. Further, one animal in control group and four animals in treatment groups did not show signs of estrus till the end of this experiment. The mean of postpartum interval to estrus was 64.29±9.97 days for control group while it was 55.50±5.36 days for treatment groups (combined T_1 and T_2 groups). Findings of [8,11,13,24-27] are in agreement with the findings of this study as it was found that suckling prolongs the acyclicity of estrus and suppress the ovarian activity of dam. The results are shown in [Table-6].

Table-6 *Average Pospartum Interval to estrus in Surti buffaloes*

Groups	Pospartum Interval to oestrus (days)
Control	64.29±9.97 (7)
Treatment (T_1 and T_2)	55.50±5.36 (12)
Overall	58.74±4.93 (19)

Conclusion

From the findings of this study, it may be concluded that artificial rearing of buffalo calves results in higher saleable milk yield from dams as well as lower postpartum interval to estrus thus may improve the profit of rearing dairy buffaloes.

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Author Contributions: All author equally contributed

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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