RESEARCH ARTICLE Indian Journal of Animal Research, Volume 59 Issue 12: 2158-2161 (December 2025)

Effect of Parity, Lactation Length and Season of Calving on Milk Production in Nili Ravi Buffaloes Maintained at Livestock Farm, GADVASU, Ludhiana

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10.18805/IJAR.B-4868

ABSTRACT

Background: Nili Ravi buffalo breed is one of the best milk-producing buffalo breeds with excellent potential for milk production. In the present investigation, we studied the effect of non-genetic factors on milk production traits in Nili Ravi buffalo.

Methods: In the present study, we analyzed the factors affecting milk production traits in 279 standardized lactation records in Nili Ravi buffaloes maintained at the Directorate of Livestock Farm, GADVASU, Ludhiana, from 2009 to 2020. The effect of lactation length (LL), parity and season of calving (SOC) on milk production were analyzed using GLM (General Linear Model) IBM SPSS Statistics 26 version software.

Result: The overall 305 days corrected milk yield of Nili Ravi buffalo was 2247.09±26.51 kg with an average lactation length of 274.72±62.78 days. The effect of SOC and parity number was found to be significant (P≤0.05) on the 305 days of corrected milk yield, whereas the effect of lactation length was found significant on lactation milk yield (P≤0.01). It is concluded that the lactation length, parity and calving season significantly affect the milk production trait in Nili Ravi buffalo.

Key words: 305 days milk yield, A season of calving, Nili Ravi, Parity.

INTRODUCTION

According to the 20th Livestock Census, the total bovine population of India is 303.76 million, out of which buffaloes are 109.85 million. Buffaloes contribute around 49.0% to the whole milk yield of India, with an average daily milk yield of 6.43 kg/day at the national level. Mainly, the average daily milk productivity of buffaloes from Punjab is 8.44 kg/day (DHAD, Annual Report 2020-21). The Nili Ravi buffalo, is one of the most crucial milch type Indian buffalo breeds having good milk yield and fat yield. This breed is found around Sutlej valley in the Ferozpur district of Punjab. Nili Ravi is an efficient milk producer with an average milk yield of 1500-1800 kg per lactation; the inter-calving period is 500-550 days. The age at first calving is 45 to 50 months Yadav *et al*. (2017). Recently, it has been observed that the Nili Ravi buffalo population is declining and needs immediate attention of policymakers, buffalo breeders and farmers for conservation and genetic improvement of this resourceful buffalo breed. The enhancement in the overall productivity of dairy animals requires targeting and studying various factors responsible for variations in these traits of genetic and non-genetic origin. The Non-genetic factors comprise the environmental factors like season, temperature, feed resources, management, parity of animals, *etc*. have an essential role in influencing the milk production potential of the Nili Ravi buffaloes. With this rationale, the present study was designed to investigate the effect of lactation length (LL), parity and season of calving (SOC) on milk production in the Nili Ravi buffaloes maintained at the Directorate of Livestock farm, GADVASU, Ludhiana, Punjab.

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How to cite this article: Shende, T.C., Kaur, S., Mukhopadhyay, C.S., Malhotra, P. and Kashyap, N. (2025). Effect of Parity, Lactation Length and Season of Calving on Milk Production in Nili Ravi Buffaloes Maintained at Livestock Farm Gadvasu, Ludhiana. *Indian Journal of Animal Research*. **59(12):** 2158-2161. doi: 10.18805/IJAR.B-4868.

Submitted: 17-01-2022 **Accepted:** 17-08-2022 **Online:** 25-08-2022

MATERIALS AND METHODS

The present study was conducted at the Directorate of livestock, GADVASU, Ludhiana, located at latitude and longitude coordinates of 30° 54′ 3.4740″ N and 75° 51′ 26.1972″ E. The climatic conditions during the study period were warm and temperate, with an average annual temperature of around 23.5°C. All the phenotypic data required for the present study was collected from pedigree sheets of Nili Ravi buffaloes maintained for 11 years at the Directorate of Livestock Farm, GADVASU, Ludhiana. The animals were maintained under the same managemental and feeding regimes. The records of 330 lactations of 148 buffaloes were included in the study. The 15% records were

excluded from analysis for the animals having extreme outliers and lactation lengths less than 150 days and the remaining 279 standardized milk production records were used in further analysis. The records on the lactation number, the season of calving, total lactation yield, date of calving, date of drying and gestation period were recorded and lactation length for each animal was calculated using the recorded data. The available milk production data were corrected for 305 days of milk yield using simple regression of milk yield on lactation length using the formula by Syrstad (1993). The effect of the season was analyzed for three seasons, *viz*. summer, winter and rainy. The number of parities had five groups based on lactation numbers. However, the 5th group had all the animals having lactation numbers five and above. The lactation length of buffaloes was divided into eight groups (Group- I to VIII with a class width of 30 days for each group) using Sturges's method (Sturges's 1926).

The formula used for the classification of data in the current study was given by Sturges's *viz*.

$$\frac{\text{Max value - Min value}}{1+3.322 \log N}$$

Where

N= Total frequency.

The analysis of the data was carried out using GLM (General Linear Model) method to analyze the effects of various factors on milk production of Nili Ravi buffaloes using SPSS Statistics 25 (SPSS/ IBM Corp., Chicago, IL) software. Duncan's (DMRT) post hoc test was used to discover variance among the milk production means. The correlation coefficient was also calculated between lactation length Vs. Milk yield.

The GLM model used in the current study was as follows;

$$Y_{ijkl}= \mu++S_i+P_j+L_k+e_{ijkl}$$

Were,

Y_{ijk}= Milk yield of lth female under ith season of calving and jth parity and kth lactation length group.

μ= Overall population mean.

S_i= Fixed effect of season of calving (i= 1, 2...4).

P_j= Fixed effect of jth parity (J= 1, 2...4).

L_k= Fixed effect of kth group of lactation length

e_{ijkl}= Random error for lth observation under ith season, jth parity and kth group lactation length with NID (0, σ^2).

RESULTS AND DISCUSSION

The total lactation milk yield of Nili Ravi buffaloes under study was recorded as 2015.79±39.43 kg (range 820.9 to 4643.2 kg; n=279). Moreover, 305 days of corrected milk yield was found to be 2247.09±26.51kg (degrees from 1078.2 to 3867 kg; n=279). The observed average lactation length was 274.72±62.78 days (151 to 448 days; n=279). The average gestation period was 309.64±7.04 days (295 to 330 days; n=279).

The least-square means for 305 days of corrected lactational milk yield was 2247.09±26.51 kg, highly comparable with the findings of Shafique and Usmani (1996) and Hussain *et al*. (2006), who reported, that the overall means of total lactational milk yield in Nili-Ravi buffaloes was 2193.4±23.4 kg/lactation and 2191.858± 35.553 kg respectively. The values obtained for the average total lactational milk yield was 2015.79±39.43 kg in the current study, agreed with the published reports of Cady *et al*. (1983);1811 kg, (Khan and Chaudhry 2000; 1884 kg) and Afzal *et al*. (2007); 1831.6 kg. The value of average lactation length was 274.72±62.78 days. These observations are in agreement (273.3±52.8 days) with the findings of Afzal *et al*. (2007).

Effect of parity on 305 days corrected milk yield

The effect of parity has a significant impact (P≤0.01) on 305 days of corrected milk yield (Table 1) of Nili Ravi buffaloes. It was observed that the 305 days corrected milk yield of 1st lactation was significantly lower compared to the 2nd and 3rd lactation at P≤0.01 and 4th lactation at P≤0.05. The 305 days updated milk yield of 1st lactation was not found to be significantly different from the 5th and higher lactations.

The results obtained in the current study also closely match with the findings of Cady *et al*. (1983) and Afzal *et al*. (2007). A significant decline in the 305 days corrected milk yield was observed from 4th lactation onwards in the present study, which is similar to the findings of Ahmad and Shafiq (2002). The significant effect of parity on the milk yield was also reported in Sahiwal cattle (Tahir *et al*., 1989; Bajwa *et al*., 2004).

Table 1: Effect of lactation number on 305 days milk yield in kg (Least square means).

Lactation number	Number of observations	305 days corrected milk yield (kg)
Overall mean	279	2247.09±26.51
1	62	2091.84±54.90^{a}
2	75	2305.20±49.54^{b}
3	55	2364.92±57.73^{b}
4	41	2339.85±66.91^{b}
5th and above	46	2133.63±63.34^{ab}

Means with different superscripts in the same column differ significantly (P<0.05).

Table 2: Effect of season of calving on 305 days corrected milk yield in kg (Least square means).

Season of calving	Number of observations	305 days corrected milk yield (kg)
Overall mean	279	2247.09±26.51
Winter	118	2309.58±40.48^{a}
Summer	88	2162.93±45.66^{b}
Rainy	73	2268.75±50.27^{ab}

Means with different superscripts in the same column differ significantly (P<0.05).

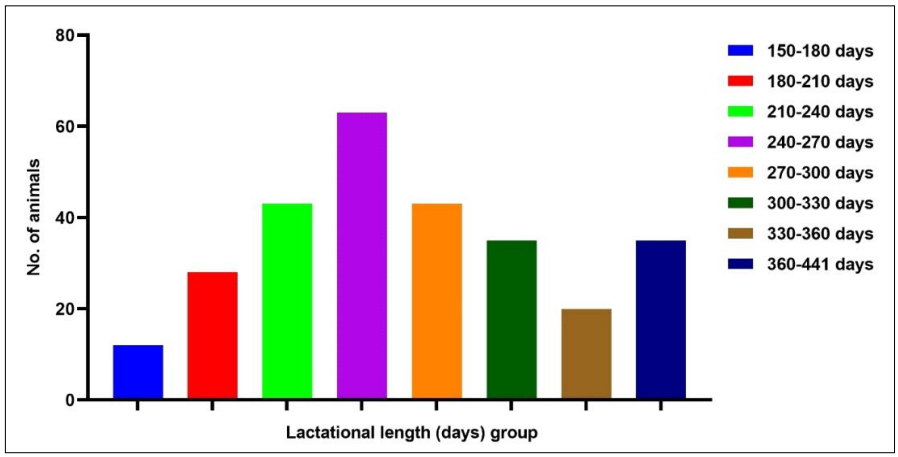

Fig 1: Number of animals in each lactation length groups.

Table 3: Effect of lactation length (group) on lactational milk yield in kg (Least square means).

Lactation length (Days)	Number of observations	Lactation milk yield (kg)
150-180	12	1140.71±132.78[a]
180-210	28	1339.27±86.92[a]
210-240	43	1617.58±70.14[b]
240-270	63	1880.89±57.95[c]
270-300	43	2176.47±70.14[d]
300-330	35	2251.31±77.75[d]
330-360	20	2537.49±102.85[e]
360-447	35	2858.09±77.75[f]

Means with different superscripts in the same column differ significantly (P<0.05).

Effect of season of calving on 305 days corrected milk yield

The season of calving showed a significant impact (P<0.05) on 305 days of corrected milk yield of Nili Ravi buffaloes (Table 2). Those buffaloes calved in the winter season showed significantly higher 305 days milk yield compared to summer calvers. The 305 days corrected milk yield did not differ among rainy and winter season calvers.

The results observed in the current study (2309.58± 40.48) were in agreement with the findings of Ahmad and Shafiq, (2002) and Afzal *et al*. (2007). The above investigations have also reported that maximum milk production in buffaloes was seen in the winter season (2400 kg) and it was lower (2237 kg) in the summer (dry and hot climate) season. The probable reason for decreased milk production in the summer season may be due to hot stressful conditions and limited availability of green fodder. The effect of different seasons on milk production has previously been studied in buffaloes. Chaudhry (1992) reported the highest milk yield in spring calving (2151 kg) and lowest in autumn calving buffaloes (1960 kg). On the contrary, findings of Raheja *et al*. (1983), Dutt and Yadav (1986) and Ghaffar *et al.* (1991) revealed a non-significant impact of seasons on milk production in Nili Ravi and Murrah buffaloes. Likewise, non-significant relation between the season of calving and milk yield in Sahiwal cattle has been reported by Verma *et al*. (2016) and Ratwan *et al*. (2020). The difference in findings on Nili Ravi buffaloes could be due to the effect of varied climatic conditions at the location, availability and types of fodder resources, nutrient contents of feed and fodders of that particular location.

Effect of length of lactation on total milk yield

In the present study, it was observed that lactation length had a significant positive correlation with lactational milk yield (r=0.744; P≤0.001), *i.e*., as lactation length increases, the lactational milk yield also showed an inclining trend. The findings obtained in the present study were found in consensus with the results of Khan, (1997); Dahlin *et al*. (1998). Moreover, it was also observed that the regression coefficient of lactation length on milk yield was significantly similar to Ahmad and Shafiq (2002); The lactational milk yield in Nili Ravi buffalo was (Table 3) lowest (1617.58± 70.14) when the lactation length was less than 210 days and it was found to be highest (2537.49±102.85) when the lactation length was 360 days and above (P≤0.01). Similar findings have been previously reported in Holstein cattle Cobanoglu *et al*. (2017). In the present study, more than 50% of lactation records of Nili Ravi buffalo had lactation length of 210 to 330 days (Fig 1).

CONCLUSION

It is concluded from the findings of the current study on Nili Ravi buffaloes that the milk production and 305 days of corrected milk yield in Nili Ravi buffaloes were significantly affected by the season of calving, lactation length and parity. Also, high milk-yielding animals had a higher lactation length of 305 days and above.

ACKNOWLEDGEMENT

The authors are grateful to the Directorate of Livestock Farm, GADVASU, Ludhiana, for providing the necessary facilities to carry out the present research work.

Conflict of interest

All authors declare that they have no conflict of interrest.

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