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RESEARCH ARTICLE

Effect of non-genetic factors on production performance of Mehsana buffalo at organized farm

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Abstract: The present investigation included the data of lactation records of 301 Mehsana buffaloes, spread over 30 years (1991-2020), collected from the records maintained at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, District Banaskantha, Gujarat; to know the effects of non-genetic factors on the production performance of Mehsana buffaloes. The data about different performance traits was collected from the records of the farm and analysed to know the effects of non-genetic factors like- period of calving, season of calving, parity and age at first calving group on the performance traits. The overall LSM of 305-Days Milk Yield (DMY), Total Milk Yield (TMY) and Lactation length (LL) was observed 1714.75±27.30L (N=1171), 1765.55±28.61L (N=1186) and 273.28 ± 3.66 days (N=1164), respectively. The effects of period of calving (P≤ 0.05), season of calving (P≤ 0.01) and parity (P≤ 0.01) had significant effects on 305-DMY, but TMY was affected by period of calving, season of calving and AFC group (P≤ 0.01). Similarly, LL was significantly (P≤ 0.05) influenced by the period of calving and the AFC group, but the season of calving and parity had a highly significant (P≤ 0.01) effect on LL of Mehsana buffaloes. Therefore, based on these observations it was concluded that significant effect of non-genetic factors plays an important role in improving the production performance of the Mehsana buffalo herd, therefore emphasis must be given on nutrition, management and healthcare practices to improve the performance of the indigenous breed on the farm.

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Introduction

India is a leading milk-producing country across the world. Gujarat possesses a rich biodiversity of buffalo population, and inhabits four well-established buffalo breeds *viz.*, Mehsana, Surti, Jaffarabadi and Banni. As per 19th Livestock Census, the total number of buffalo in the country is 108.7 million. The buffalo constitute around 21.23% of the total livestock population of India (Annual Report, 2016-2017). Mehsana is one of the best dairy breed of buffalo and is considered to be regular breeder. Although the breed has contributed significantly in the milk production and had greater role in 'Operation flood' programme initiated to augment milk production in India, but the genetic potential of this breed has not been utilised to the fullest. Looking towards the contribution of buffalo, which has occupied an important place in the agricultural economy of India, because of their adaptability to harsh climatic conditions, tolerance to tropical diseases and have the ability to convert the poor quality roughages into the milk, meat and draught power, where important buffalo breeds originated from Gujarat and its total population is 10.5 million while total Mehsana buffalo population is 2.67 million. Among these breeds, Mehsana is well known for its characteristics like: higher milk production and "persistent milking and regular breeding".

It is important to remember that income from dairy enterprises largely depends upon the efficiency of production performance of the dairy herd. At the same time, it is highly desirable to record the major economic attributes such as lactation yield, lactation length, etc of the animals kept for milk production. non-genetic factors. Therefore, precise and accurate knowledge of different economic parameters is important to plan appropriate selection, breeding, feeding and marketing strategies for the improvement of the herd. Looking above facts, improvement in the production characteristics of indigenous breeds has become essential for keeping dairy enterprises economically viable, while improvement in the performance of indigenous breeds can be achieved by implementing appropriate management and breeding strategies. The non-genetic factors have a great role in determining the

production traits. The season or period of calving determines what animal will get to feed when the animal will be lactating like availability of fodder, temperature, humidity etc. The present investigation has been done to study the effect of non-genetic factors on the production performance of Mehsana buffalo.

Material and Methods

The relevant data on the present investigation was collected from the history cum pedigree sheets maintained at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat during the period from 1991-2020. Geographically, Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar is located in North Gujarat. The climate of the livestock research station is semi-arid. The animals of all age groups are reared under similar climatic conditions. Management practices followed on the farm were uniform for the herd. All animals were housed under a loose housing system with adequate sheds for shelter against sun, rain and extreme winter. All animals at the farm were stall-fed with dry roughages, green fodder and concentrate in proper proportion. The animals having lactation length of less than 100 days, incomplete lactation due to sale or death during lactation, abortion and stillbirth etc. were considered as abnormal lactation and not included in the study. The data pertaining to Mehsana buffaloes was maintained over a period of 30 years from 1991-2020. The data was grouped into 6 periods with a duration of 5 years viz. P1: 1991-1995, P2: 1996-2000, P3: 2001-2005, P4: 2006-2010, P5: 2011-2015 and P6: 2016-2020. Each year was delineated into 3 seasons each with a duration of 4 months viz. S1: Nov-Feb (winter), S2: Mar-Jun (summer) and S3: July-Oct (Rainy). The records on parity was collected from history sheets of individual animals having 1st to e"5th parities. The age at first calving group were classified based on age at first calving of Mehsana buffaloes as A-1: <1151 days, A-2: 1151-1541 days and A-3: >1541 days. The traits included in the study were 305-Days Milk Yield, Total Milk Yield and Lactation Length.The period of calving, season of calving, parity and age at first calving group were considered as fixed effects for all production traits. The least squares analysis of variance for unequal sub-class numbers (Harvey, 1990) considering six periods, three seasons, five parities and three age at first calving groups was used to analyze the data on various production and reproduction traits using the following statistical model. The least squares of variance analysis was done using LSML software package

$$Y_{ijklm} = \mu + A_i + B_j + C_k + D_l + e_{ijklm}$$

Where,

Y_{ijklm} = m^{th} record of buffalo calved in i^{th} period, j^{th} season, k^{th} parity and l^{th} age at first calving group

μ = Population mean

A_i = Fixed effect of i^{th} period of calving where i = 1, 2, 3, 4, 5 and 6

B_j = Fixed effect of j^{th} season of calving where j = 1, 2 and 3

C_k = Fixed effect of k^{th} parity where k = 1, 2, 3, 4 and 5 & above

D_l = Fixed effect of l^{th} age at first calving group where l = 1, 2 and 3

e_{ijklm} = Random error assumed to be normally and independently distributed with zero mean and constant variance (NID, 0, σ^2).

The difference of means between any two subclasses of period, season, parity and age at first calving group was tested for significance using Duncan's Multiple Range Test (DMRT) as modified by Kramer (1957).

Results and Discussion

The present investigation was conducted at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, District-Banaskantha, Gujarat to evaluate the production performance of Mehsana buffaloes maintained from 1991-2020. The climatic conditions of the region are semi-arid, where summer is dry and hot and the temperature goes up to 40°C, while winter is not stressful as the average temperature remains from 10 C to 30°C with relative humidity 69% and 48% in morning and afternoon, respectively. The data about 305 DMY, TMY and LL was evaluated from the records maintained at the farm and analyzed to know the effects of non-genetic factors like period, season, parity and AFC group studied and results are depicted in Table: 1, 2, 3 and 4.

305-Days Milk Yield (305-DMY)

The LSM for 305 DMY of Mehsana buffaloes having 1171 lactation records was calculated as 1714.75±27.30 lit (Table 1). The values for 305-DMY were in close agreement with Gupta et al. (2012) as 1760.69 ± 42.25 kg and Thiruvenkadan et al. (2014) as 1804.9 ± 14.7 kg in Murrah buffaloes. The present values are contrasted with the findings of Bharat et al. (2004) for Mehsana buffaloes and Rathod et al. (2018) in Surti buffalo. However, comparatively higher estimates of 305 DMY than the present findings were reported by Pawar et al. (2012), Jamuna et al. (2015) and Jakhar et al. (2016). Lactation milk yield of dairy animal's upto 305-days of lactation is the criterion most commonly used for the selection of dairy animals and study the performance of such trait is of paramount importance for carrying out selection. However, 305 days milk yield of Mehsana buffaloes is 1988 kg (AGRI-IS, NBAGR).

The average LSM for 305 DMY of Mehsana buffaloes during different periods of calving viz. P1, P2, P3, P4, P5 and P6 were 1600.51 ± 40.07 lit, 1669.89 ± 46.00 lit, 1707.00 ± 46.48 lit, 1707.49 ± 43.29 lit, 1761.88 ± 51.95 lit and 1841.75 ± 60.24 lit, respectively (Table 1). Further, it was revealed that 305 DMY was lowest in P1 (1600.51 ± 40.07 lit) and highest in P6 (1841.75 ± 60.24 lit). In the present study, it was found that the period of calving had a significant (P≤ 0.05) effect on 305 DMY. These findings are in close agreement with Galsar et al. (2016a) in Mehsana buffaloes and Verma et al. (2017) in Murrah buffaloes. Moreover, Thiruvenkadan et al. (2010), Chaudhary (2015) and Chaudhari (2016) reported highly significant effect (P≤ 0.01). The significant effect of period of calving indicated that this improvement in the performance of the herd might be due to better management, grading-up practices followed on the farm and better health coverage of the animals.

The performance of Mehsana buffaloes calving during winter, summer and rainy season were 1803.72 ± 35.62 lit, 1724.84 ± 54.20 lit and 1615.70 ± 28.95 lit, respectively (Table 2). However, the 305 DMY of Mehsana buffaloes calving during winter and summer season was highest and it differed significantly from that of rainy season calvers. The season of calving had a highly significant (Pd"0.01) effect on 305 DMY in this investigation. However, similar effects were reported by Thiruvenkadan et al. (2014) and Chaudhary (2015) in Murrah buffaloes; Chaudhari (2016) in Mehsana buffaloes observed highly significant (P≤ 0.01) effect of the season of calving on 305 DMY, which were in line with the present findings of Mehsana buffaloes. The decrease in milk yield might be because of high environmental temperature and humidity during summer and rainy season, respectively. Season can affect milk production in two ways: by including deficiency of fodder and by the extreme temperatures that may suppress production at the peak of lactation curve (Afzal et al. 2007; Hernandez-Castellano et al. 2019). Whereas, it is in contrast with the findings of Verma et al. (2017).

The least squares mean of 305 DMY were observed under different parities viz. L1, L2, L3, L4 and e"L5 viz: 1604.31 ± 37.26 lit, 1733.25 ± 44.48 lit, 1753.34 ± 48.32 lit, 1767.27 ± 55.27 lit and 1715.60 ± 37.45 lit, respectively (Table 3). The effect of parity was highly significant (P≤ 0.01) on 305 DMY in the present findings of Mehsana buffaloes. It was revealed that 305 DMY increased from 1st to 4th parity and thereafter it started declining. It is in close agreement with the findings of Thiruvenkadan et al. (2014) and Chaudhary (2015) in Murrah buffaloes. Bharat et al. (2004) and Verma et al. (2017), observed that significant (P≤ 0.05) effect of parity on 305 DMY.

The LSM of 305 DMY were observed under different AFC groups viz. A1, A2 and A3 as 1641.90±41.08 lit, 1735.42±26.08 lit and 1766.94±55.39 lit, respectively (Table 4). However, results shows that AFC group did not have any affect on 305 DMY in the present study, but the lowest 305 DMY was observed in A1 (1641.90 ± 41.08 lit) and the highest 305 DMY was observed in A3 (1766.94 ± 55.39 lit). These findings are in close agreement with Thiruvenkadan et al. (2010), Jamuna et al. (2015), Jakhar et al. (2016) and Verma et al. (2017). Chaudhary (2015) observed a significant (P≤ 0.05) effect of age at first calving group on 305 DMY in Murrah and Nili-ravi buffaloes. The age at first calving is also an important trait for bringing improvement in milk production. Also, AFC considerably affects the productive life of an animal and the number of calves produced during her life time. From the economic point of view, reduction in AFC is desirable for reducing the rearing cost of heifer and milk production cost.

Total Milk Yield (TMY)

It is the total amount of milk produced by an animal during a particular lactation period. Milk yield is an important polygenic trait of dairy animals and it is directly related to the genetic potential of the breed and management practices of the herd.

Table 1: Effect of period of calving on 305-DMY, TMY and LL of Mehsana buffaloes

Sr. No.	Factors	305-days milk yield (lit)	Total milk yield (lit)	Lactation length (days)
1.	Population Mean (μ ± S.E.)	1714.75 ± 27.30 (1171)	1765.55 ± 28.61 (1186)	273.28 ± 3.66 (1164)
2.	Period of calving	*	**	*
	P1	1600.51 ± 40.07 (239)^{c}	1660.20 ± 42.58 (239)^{c}	287.41 ± 5.53 (234)^{a}
	P2	1669.89 ± 46.00 (218)^{bc}	1711.44 ± 48.68 (219)^{bc}	272.04 ± 6.38 (205)^{bc}
	P3	1707.00 ± 46.48 (222)^{b}	1741.95 ± 49.27 (222)^{bc}	264.82 ± 6.34 (222)^{c}
	P4	1707.49 ± 43.29 (251)^{b}	1743.19 ± 45.60 (256)^{bc}	271.06 ± 5.93 (252)^{bc}
	P5	1761.88 ± 51.95 (140)^{ab}	1794.13 ± 53.84 (147)^{ab}	263.18 ± 6.93 (144)^{c}
	P6	1841.75 ± 60.24 (101)^{a}	1942.39 ± 62.97 (103)^{a}	281.15 ± 7.99 (107)^{ab}

Note: Figures in parenthesis indicates number of observation/records., **P<0.01 highly significant; *P<0.05 significant; NS= Non-significant; S.E.= Standard Error; N= Subclass means with different superscripts are significantly different from each other

The average TMY of Mehsana buffaloes based on 1186 observations was 1765.55 ± 28.61 lit (Table 1), which was lowest (1660.20 ± 42.58 lit) during the period from 1991 to 95 and highest (1942.39 ± 62.97 lit) during the period from 2016 to 2020. This shows that there is an increase of 282.19 lit of milk per lactation over the period of 30 years. This improvement might be due to better management practices and a proper breeding plan of the farm. The present findings are within the range of the estimates reported by Thiruvenkadan et al. (2010) as 1686.2 ± 44.4 kg and Thiruvenkadan et al. (2014) as 1855.6 ± 16.1 kg in Murrah buffaloes; Galsar et al. (2016a) as 1851.98 ± 19.73 lit in Mehsana buffaloes. The present estimates of TMY were much higher than those reported by Bharat et al. (2004), Charlini and Sinniah (2015) and Rathod et al. (2018). The present findings are contradictory to the findings of Chaudhari (2016) and Sathwara et al. (2020) for Mehsana buffaloes.

The average LSM of TMY of Mehsana buffaloes during different periods of calving viz. P1, P2, P3, P4, P5 and P6 were 1660.20 ± 42.58 lit, 1711.44 ± 48.68 lit, 1741.95±49.27 lit, 1743.19±45.60 lit, 1794.13 ± 53.84 lit and 1942.39±62.97 lit, respectively (Table 1). The TMY was lowest in P1 (1660.20±42.58 lit) and highest in P6 (1942.39±62.97 lit). The period of calving had highly significant (P≤ 0.01) effect on TMY in the present study and it is in close agreement with Chaudhary (2015) and Galsar et al. (2016a) for Nili-ravi and Mehsana buffaloes, respectively. Similarly, significant (P≤ 0.05) effects of the period of calving on TMY were reported by Bharat et al. (2004), Jakhar et al. (2016) and Verma et al. (2017). The significant effect of the period of calving indicated that there may be differences in feeding practices, proper breeding plan, management practices and climatic conditions during different periods.

The LSM of TMY of Mehsana buffaloes during winter, summer and rainy season were 1856.57 ± 37.30 lit, 1783.25 ± 57.27 lit and 1656.82 ± 30.29 lit, respectively (Table 2). The TMY was highest during winter season and lowest during rainy season. The effect of season of calving on TMY was observed highly significant (P≤ 0.01) in the present study and it is in accordance with Chaudhary (2015) in Murrah buffaloes. Thiruvenkadan et al. (2014) and Verma et al. (2017) in Murrah buffaloes reported that significant (P≤ 0.05) effect of season of calving on TMY. In contrast to present results the findings of Chaudhary (2015) and Jakhar et al. (2016) reported that season of calving had non-significant effect on TMY. The buffaloes calved during winter season give their better performances than the buffaloes calved in rainy season might be due to the fact that winter season is followed by rainy season in which there is abundant availability of fodders in the subsequent winter and summer seasons.

The performance of Mehsana buffaloes under different parities viz. L1, L2, L3, L4 and e"L5 and found 1683.79 ± 39.10 lit, 1783.75 ± 47.04 lit, 1793.95 ± 51.04 lit, 1816.84 ± 58.20 lit and 1749.41 ± 39.19 lit, respectively (Table 3). However, TMY increased from 1st to 4th parity, but decline thereafter. In the present findings of Mehsana buffaloes found that parity had a non-significant effect on TMY and it is in accordance with Bharat et al. (2004) in Surti buffaloes. Contradictory to present findings, Jakhar et al. (2016) and Verma et al. (2017) reported a significant (P≤ 0.05) effect of parity which is not in accordance with present findings; Thiruvenkadan et al. (2014) and Galsar et al. (2016a) reported highly significant (P≤ 0.01) effect of parity on TMY.

The age at first calving group had a highly significant (Pd"0.01) effect on the TMY of Mehsana buffaloes. The TMY was lowest (1671.88 ± 43.42 lit) in the age at first calving group1 (A1), followed by A2 (1782.73±27.61 lit) and A3 (1842.04±57.48 lit) (Table 4). Thiruvenkadan et al. (2010) and Charlini and Sinniah (2015) reported that non-significant effect of age at first calving group on TMY. Although AFC group has significant effect on TMY, but with the increase in AFC, there was substantial increase in TMY also.

Lactation Length

Lactation length is one of the important trait which affects the lactation milk yield. However, there are various factors such as

Table 2: Effect of season of calving on 305-DMY, TMY and LL of Mehsana buffaloes

Sr.No.	Factors	305-days milk yield (lit)	Total milk yield (lit)	Lactation length (days)
1.	Population Mean (μ ± S.E.)	1714.75 ± 27.30 (1171)	1765.55 ± 28.61 (1186)	273.28 ± 3.66 (1164)
2.	Season of calving	**	**	**
	S1	1803.72 ± 35.62 (322)^{a}	1856.57 ± 37.30 (329)^{a}	278.25 ± 4.83 (326)^{a}
	S2	1724.84 ± 54.20 (124)^{ab}	1783.25 ± 57.27 (125)^{a}	278.97 ± 7.30 (127)^{a}
	S3	1615.70 ± 28.95 (725)^{b}	1656.82 ± 30.29 (732)^{b}	262.61 ± 3.93 (711)^{b}

Note: Figures in parenthesis indicates number of observation/records., **P<0.01 highly significant; *P<0.05 significant; NS= Non-significant; S.E.= Standard Error; N= Subclass means with different superscripts are significantly different from each other

Table 3: Effect of parity on 305-DMY, TMY and LL of Mehsana buffaloes

Sr. No.	Factors	305-days milk yield (Kg)	Total milk yield (Kg)	Lactation length (days)
1.	Population Mean (μ ± S.E.)	1714.75 ± 27.30 (1171)	1765.55 ± 28.61 (1186)	273.28 ± 3.66 (1164)
2.	Parity	**	NS	**
	L1	1604.31 ± 37.26 (336)^{b}	1683.79 ± 39.10 (340)	296.37 ± 5.05 (338)^{a}
	L2	1733.25 ± 44.48 (216)^{a}	1783.75 ± 47.04 (217)	272.57 ± 6.06 (213)^{b}
	L3	1753.34 ± 48.32 (173)^{a}	1793.95 ± 51.04 (174)	263.77 ± 6.54 (175)^{b}
	L-4	1767.27 ± 55.27 (128)^{a}	1816.84 ± 58.20 (130)	271.58 ± 7.53 (128)^{b}
	≥L-5	1715.60 ± 37.45 (318)^{a}	1749.41 ± 39.19 (325)	262.09 ± 5.13 (310)^{c}

Note: Figures in parenthesis indicates number of observation/records., **P<0.01 highly significant; *P<0.05 significant; NS= Non-significant; S.E.= Standard Error; N= Subclass means with different superscripts are significantly different from each other

Table 4: Effect of AFC group on 305-DMY, TMY and LL of Mehsana buffaloes

Sr. No.	Factors	305-days milk yield (Kg)	Total milk yield (Kg)	Lactation length (days)
1.	Population Mean (μ ± S.E.)	1714.75 ± 27.30 (1171)	1765.55 ± 28.61 (1186)	273.28 ± 3.66 (1164)
2.	AFC group	NS	**	*
	A1	1641.90 ± 41.08 (217)	1671.88 ± 43.42 (220)^{b}	262.47 ± 5.63 (215)^{b}
	A2	1735.42 ± 26.08 (834)	1782.73 ± 27.61 (840)^{a}	270.27 ± 3.55 (825)^{b}
	A3	1766.94 ± 55.39 (120)	1842.04 ± 57.48 (126)^{a}	287.09 ± 7.42 (124)^{a}

Note: Figures in parenthesis indicates number of observation/records., **P<0.01 highly significant; *P<0.05 significant; NS= Non-significant; S.E.= Standard Error; N= Subclass means with different superscripts are significantly different from each other

availability of feed and fodder, managemental practices and seasonal variation which affects the lactation length.

The LSM for LL based on 1164 number of observation was found 273.28 ± 3.66 days, which was highest (296.37 ± 5.05 days) in 1st parity and lowest (262.09 ± 5.13 days) in e"5th parity (Table 1). This shows that as the parity advanced, the duration of LL decreased (34.28 days) over 30 years. This improvement might be due to better management practices adopted at the farm. These findings are in close association with the reports of Bharat et al. (2004) as 294.44 ± 6.66 days in Surti buffaloes, Jamuna et al. (2015) as 286.08 ± 2.23 days in Murrah buffaloes, Galsar et al. (2016a) as 298.84 ± 4.33 days and Galsar et al. (2016b) as 281.17±2.58 days in Mehsana buffaloes. The results are contrast with the findings of Gupta et al. (2012), Chaudhari (2016), Prajapati et al. (2018), Patel et al. (2019) and Bhatt (2019) reported comparatively higher LL. Moreover, Rathod et al. (2018) reported lower LL than that of present study. The variations observed in LL by research workers may be due to differences in feeding and management practices of buffaloes.

The LSM of lactation length of Mehsana buffaloes during different periods of calving *viz.* P1, P2, P3, P4, P5 and P6 were 287.41 ± 5.53 days, 272.04 ± 6.38 days, 264.82 ± 6.34 days, 271.06 ± 5.93 days, 263.18 ± 6.93 days and 281.15 ± 7.99 days, respectively (Table 1). It was observed that period of calving had significant (Pd≤0.05) effect on lactation length of Mehsana buffaloes. The highest LL was observed during P1 (287.41 ± 5.53 days) and lowest during P5 (263.18 ± 6.93 days). The present findings was in accordance with those of Charlini and Sinniah (2015), Galsar et al. (2016b), Prajapati et al. (2018) and Bhatt (2019) in Mehsana buffaloes. The present findings are contrast with the findings of Jamuna et al. (2015) and Jakhar et al. (2016).

The average LL of Mehsana buffaloes calving during winter or summer season have longer LL viz: 278.25 ± 4.83 days and 278.97 ± 7.30 days, respectively than rainy season calvers, which have shorter LL i.e. about 262.61 ± 3.93 days (Table 2). The effects of season of calving of LL had highly significant (P≤ 0.01) on Mehsana buffaloes. The season or period of calving determines what animal will get to feed when the animal will be lactating like availability of fodder, temperature, humidity etc. The present findings are in close agreement with Bharat et al. (2004) in Mehsana and Surti buffaloes. The present findings are contrast with the findings of Eldawy et al. (2021), Galsar et al. (2016a) and Galsar et al. (2016b) in Mehsana buffaloes.

The LSM of LL observed under different parities viz. L1, L2, L3, L4 and e"L5 were 296.37 ± 5.05 days, 272.57 ± 6.06 days, 263.77 ± 6.54 days, 271.58 ± 7.53 days and 262.09 ± 5.13 days, respectively (Table 3). The effects of parity on LL was highly significant (P≤0.01) in this study on Mehsana buffaloes. Parity may have a role in lactation length as sex of calf , use of different sire etc.The mean comparison of LL was significantly highest in 1st parity and lowest in e"5th parity. The present findings are in accordance with the findings of Thiruvenkadan et al. (2014), Chaudhary (2015) and Galsar et al. (2016a). Jakhar et al. (2016) and Galsar et al. (2016b). In present findings are contrast with the findings of Bharat et al. (2004) and Jamuna et al. (2015).

The analysis of variance (Table 4) revealed that AFC group had significant (P≤ 0.05) effect on lactation length of Mehsana buffaloes. The present findings is in accordance with Jamuna et al. (2015) in Murrah buffaloes and Prajapati et al. (2018) in Mehsana buffaloes. On the other hand, Chaudhary (2015) in Nili-ravi buffaloes and Bhatt (2019) in Mehsana buffaloes reported non-significant effect of age at first calving group on LL, which is reverse with the present findings of Mehsana buffaloes. The LL in A1 was lowest as 262.47 ± 5.63 days and highest in A3 as 287.09 ± 7.42 days.

Conclusion

On the basis of results obtained in the study, we can conclude that the milk production performance of Mehsana buffaloes has improved significantly over a period of 30 years (1991 to 2020) maintained under organized herd. Improvement of these traits might be due to better, feeding, breeding, health care and proper culling strategies followed on the farm. However, the season of calving, period of calving and parity have significant effects on the performance of the herd, hence such non-genetic factors must be taken into consideration in future, for further improvement of the herd

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Conflict of interests

The authors declare that there are no conflicts of interest.

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