Research Article

EFFECT OF GENETIC AND NON-GENETIC FACTORS ON PRODUCTION PERFORMANCE OF SAHIWAL COWS

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Abstract: The present study was undertaken to assess production performance traits of Sahiwal cows, maintained at the Bull Mother Experimental Farm, Anjora, Durg (Chhattisgarh). The objectives were to evaluate the effect of various non-genetic and genetic factors on some important production traits generated during the 9 years (from 2001 to 2009). The selected traits considered were Total Lactation Yield (TLY) and Lactation Length (LL). The overall least squares means for TLY and LL were found registered as 1322.135±33.141 kg and 293.294±3.416 days, respectively. The analysis of variance revealed that season had no effect on TLY and LL. The period effect was found to be highly significant (P<0.01) for TLY and LL whereas the effect of parity was found non-significant for both traits. The sire effect was found to be non-significant for all traits. The TLY increased from period 1st to 3rd period. The results indicated gradual improvement of milk yield from 2001 to 2009 in Sahiwal cows and remained similar during different seasons and among different parities. The progenies of different sires had also similar productive performances.

Keywords: Sahiwal, Genetic Traits, Non-Genetic Traits and Production Performance

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Introduction

A selective breeding is an essential aspect of genetic improvement of Sahiwal cattle for conservation, preservation and propagation to improve milk yield with own native germ plasma as per new breeding polices of India. To start extensive and efficient breeding programme for Sahiwal cattle in our country, the knowledge of key genetic and non-genetic economic traits effect on Production performance of Sahiwal Cows is prerequisite on different agro climatic condition of India so that improvement of production performance of Sahiwal Cows can be achieved with appropriate selection procedures. Noticeably, Sahiwal breed is unique for its high milk production with good fat percentage and economical returns under any agro ecosystem. Sahiwal breed necessitates improvement programme with concrete policy should in their respective breeding tract for their conservation. However, recently declining trend in Sahiwal population has been observed because of negligence as well as cross breeding [1]. Therefore, concrete efforts be attempted to conserve this breed. To facilitate this, it is vital to know its genetic and non genetic factors that affect on production performances in different part of country with variable environmental condition. Non genetic factors such as period, season and genetic factors like parity, sex and sire affect its productivity of animals including Sahiwal cows. Therefore, the present study was aimed to evaluate the influence of sire, period, season and parity on production performance of Sahiwal cows with available data generated at "Bull Mother Experimental Farm (BMEF), Anjora, Durg (C.G).

Materials and Methods

Collection of Data
The data for the present investigation were obtained from the performance records and daily milk yield record registers of Sahiwal cows, maintained at the "BMEF, Anjora, Durg (C.G.)" generated during the past 9 years period (2001 to 2009). The standard feeding and management practices were followed in the farm. The animal were let loose for grazing during day time and tied in the cow's sheds during night. The newborn calves were maintained under sucking system. The cows were bred by natural services by farm-bred bulls in the past, but now days the breeding is done by frozen semen of Sahiwal bulls supplied by the N.D.R.I Karnal, Haryana. The cows were milked twice a day at 3am in morning and 3pm at evening. The records of milk yield of individual cow was also maintained for morning and evening yield separately.

Screening of Data

During this study, around 421 data records were initially taken in to consideration. The data of Sahiwal cows whose date of birth and sire number could not be ascertained as well as abnormal disorders or incomplete lactation due to culling of cows were also excluded in this study.

Classification of data

The data obtained from BMEF, Anjora, Durg were classified on the basis of period, season, parity, sex and sire. The entire duration of nine years was classified in to three periods of three years each. The year was further divided in to four seasons depending upon the temperature and rainfall prevailing in this region. The animals were also classified according to their parity. Total lactation yield and Lactation Length traits were evaluated.

Result and Discussion

General performance:

The overall means for total lactation yield (TLY) and lactation length (LL), were found as 1322.135±33.141 kg and 293.294±3.416 days, respectively. The results are depicted in [Tables-1-4].

Table-1 *Period and season wise least squares means (days) for total lactation yield (TLY) (kg)*

Effect	N	LSM± SE
Overall	269	1322.135±33.141
Period		
1	81	972.296±81.530
2	109	1265.756±62.402
3	79	1583.428±77.137
Season		
1	103	1205.883±58.941
2	52	1260.449±76.765
3	35	1283.805±98.042
4	79	1345.170±62.648
Parity		
1	66	1240.261±82.822
2	63	1272.888±73.248
3	47	1257.193±83.334
4	93	1324.966±76.9248

Table-2 *Sire wise least squares means (days) for total lactation yield (kg)*

Effect	N	LSM± SE
Overall	269	1322.135±33.141
Sire code		
1	13	1152.294±165.484
2	28	1384.655±103.821
3	20	1403.290±127.739
5	14	1484.364±158.482
6	7	1285.182±215.328
7	5	1837.258±251.110
8	9	1424.844±188.160
9	27	1272.567±100.977
10	29	1534.851±95.360
12	32	1386.707±97.545
13	10	1398.917±167.930
14	10	1021.725±169.550
15	5	1402.119±234.913
16	4	770.254±259.089
17	17	1317.612±135.890
18	14	1156.553±149.672
19	7	869.631±211.784
20	9	1203.090±195.864
21	5	1173.693±238.524
23	4	996.932±277.520

Effect of genetic and non-genetic factors on different economic traits

The parity has significant effect on TLY and LL [Table-3]. Our results revealed that the season had non-significant effect on all the traits. Similarly, our results showed that sire has no effect on all traits.

Table-3 *Period, season and parity wise least squares means (days) for lactation length (LL)*

Effect	N	LSM± SE
Overall	197	491.482±8.171
Period		
1	70	282.822±8.784
2	92	304.324±6.726
3	69	291.607±8.551
Season		
1	84	296.108±6.483
2	48	302.299±8.103
3	31	288.114±10.694
4	68	285.152±6.716
Parity		
1	56	292.125±9.210
2	52	291.710±8.177
3	39	299.302±9.328
4	84	288.535±7.988

Total lactation yield

The overall least squares mean for TLY found was 1322.135±33.141 kg which is almost comparable with the value obtained by Zafar *et al*. (2008) [2] but less in comparison to LSMs observed by Bhatnagar *et al*. (1983) [3], Sharma *et al*. (1987) [4], Yadav *et al*. (1995) [5], Singh (1996) [6], Singh and Nagarcenkar (1997) [7] and Raja and Narula (2007) [8]. This may be attributed to differences in the climatic and managemental conditions and also may be due to difference in stage of animals. It is important to mention here that suckling is practiced in the farm therefore the amount of milk consumed by calves was not accounted which may be the probable reason for lower value of TLY in the present investigation however the LSM for period 3 (1583.428±77.137) is directly comparable with the findings of other workers. We also observed significant (P<0.01) period to period variation. The significant effect of period of calving on lactation yield has been reported by Singh (1996) [6], Sethi *et al*. (2001) [9], Singh *et al*. (2005) [10], Rehman *et al*. (2006) [11], Raja and Narula (2007) [8] and Zafar *et al*. (2008)[2] in Sahiwal cows. The data of total lactation yield depicted gradual improvement in TLY from period 1 to 3. The fluctuations of TLY in different periods depend on factors like management, availability of feed and fodders and health of animals. It cannot be expected for all these factors to remain constant from period to period.

The seasonal differences in the total lactation yield were statistically non-significant. Non-significant effect of season of calving on LY in Sahiwal cows have been reported by Bhatnagar *et al*. (1983) [3], Sharma *et al*. (1987) [4], Yadav and Rathi (1992) [12], Sethi *et al*. (2001) [9] and Raja and Narula (2007) [8]. Contrary to our results, the season effects were reported to be significant by Singh (1996) [6], Javed *et al*. (2000) [13], Bajwa *et al*. (2004) [14], Singh *et al*. (2005) [10], Rehman *et al*. (2006) [11] and Zafar *et al*. (2008) [2] in Sahiwal cows. It was found that the LSMs ranged from 1205.883±58.941 kg during spring to 1345.170±62.648 kg during winter in Sahiwal cows. The non-significant difference in TLY due to season of calving might be due to uniform feeding and management practices followed throughout the year in the farm and the Sahiwal cows may be more resistant to the seasonal fluctuations. The variation in total lactation yield due to parity was also found to be statistically non-significant. However, an increasing trend up to 2nd parity followed by a decrease on 3rdand again increase on 4th parity, with an overall increasing trend was observed. Non-Significant effect of parity on TLY observed in the present investigation is in accordance to Singh (1996) [6], Sethi *et al*. (2001) [9] and Rehman *et al*. (2006) [11] in Sahiwal cows. Contrary to our findings Yadav and Rathi (1992) [12], Yadav *et al*. (1995) [5], Singh and Nagarcenkar (1997) [7], Javed *et al*. (2000) [13] and Zafar *et al*. (2008) [2] reported significant effect of parity on LY in Sahiwal cows. The result showed a significant higher TLY in 4th parity compared to 1st parity. The sire effect wise differences on the total lactation yield were found to be non-significant in the present investigation. Contrary to our results significant effect of sire on LY have been reported by Bhatnagar *et al*. (1983) [3], Sharma *et al*. (1987) [4] and Singh (1996) [6] in Sahiwal cows. The highest TLY was recorded by sire no. 7 (1837.258±251.110 kg) and lowest by sire no.16 (770.254±259.089kg).

Lactation length (LL)

The least squares mean of LL on different periods, seasons, parities and sires are presented in [Table-2 and 3]. The least squares analysis of variance for lactation length is given in [Table-4].

Table-4 *Least squares analysis of variance for TLY and LL*

Source of variation	TLY			LL		
	DF	MS	F value	DF	MS	F value
Period	2	3131516.302	12.059**	2	8177.415	3.105*
Season	3	261695.812	1.008	3	3023.528	1.148
Parity	3	53822.167	0.207	3	924.004	0.351
Sire	19	358175.912	1.379	18	2057.593	0.781
Remainder	241	259689.483		204	2633.490	

* Significant at 5%; ** Significant at 1%

The overall least squares mean for the LL was observed to be 293.294±3.416 days in the present study. The value is close to the optimum days (300 days). The finding is almost close with the reports of Singh *et al*. (1993) [15], Singh (1996) [6], Singh and Nagarcenkar (1997) [7]and Raja and Narula (2007) [8] in Sahiwal cows.

The LL reported by Yadav and Rathi (1992) [12], Yadav *et al.* (1995) [5] and Zafar *et al.* (2008) [2] are lower than the average obtained in present study. However, the average of LL studied by Bhatnagar *et al.* (1983) [3] and Gandhi and Gurnani (1990) [16] are higher than the average obtained in the present study. The differences in least square means of LL due to periods were significant (P<0.05). Many workers such as Yadav et al. (1995) [5], Singh (1996) [6]. Singh and Nagarcenkar (1997) [7], Dahlin *et al.* (1998) [17], Ahmad (1999) [18], Javed (1999) [19], Javed *et al.* (2000) [13], Bajwa *et al.* (2004) [14] and Rehman *et al.* (2006) [11], who reported similar findings in Sahiwal cows. However, non-significant effect of period of calving on LL was reported by Zafar *et al.* (2008) [2]. A significant (P<0.05) variation in LL was observed between period 1 and 2. The lactation length varied from 282.822±8.784 days in period 1 to 304.324±6.726 days in period 2 then LSM slightly lowered (291.607±8.551) in period 3. The fluctuations in the LL might be due to non-genetic factors like management and feeding conditions during different periods. The values of LL observed for 2nd and 3rd periods were greater than period 1 which indicated the improvement in management and feeding conditions. The seasonal differences showed non-significant effect on LL. These findings were supported by the findings of Bhatnagar et al. (1983) [3], Yadav et al. (1995) [5] and Zafar *et al.* (2008) [2]. Contrary to our findings many worker (Singh 1996) [6], Singh and Nagarcenkar (1997) [7], Dahlin *et al.* (1998) [17], Ahmad (1999) [18], Javed (1999) [19], Javed *et al.* (2000) [13], Bajwa *et al.* (2004) [14] and Rehman *et al.* (2006) [11] reported significant effect of calving season on LL in Sahiwal cows. The highest mean (302.299±8.103 days) was recorded for summer calvers and lowest (285.152±6.716 days) for the winter calvers. The parity represents non-significant effect on lactation length in present study. Non-significant effect of parity on LL in Sahiwal cows have been reported by Yadav and Rathi (1992) [12], Rehman *et al.* (2006) [11] and Zafar *et al.* (2008) [2]. Contrary to our results few workers such as Yadav *et al.* (1995) [5], Singh (1996) [6], Singh and Nagarcenkar (1997) [7] and Javed (1999) [19] reported significant effect of parity on LL in Sahiwal cows. The highest (299.302±9.328 days) was recorded in the 3rd parity and the lowest (288.535±7.988 days) in the 4th parity. The LSMs in the 1st and 2nd parities varied within a very narrow range (292.125±9.210 to 291.710±8.177 days).The sire wise differences in the lactation length were non-significant. Sire effect was non-significant on this trait as reported by Bhatnagar *et al.* (1983) [3] but Singh (1996) [6] reported significant effect of sire on LL in Sahiwal cows. The highest LL was recorded by sire no. 7 (337.723±25.790 days) and lowest by sire no. 21 (257.812±24.176days).

Conclusion
Our results demonstrated that genetic and non genetic factor period of calving influence on total milk yield and lactation length, but not all non genetic factors. The climatic condition, mange mental factors are also the predisposing factors vary the productive performance of Sahiwal cows.

Application of research: Influence of genetic and non-genetic factors on production performance in Sahiwal

Research Category: Veterinary and Animal Science

Abbreviations: TLY: Total lactation yield, LL: lactation length.

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Sample Collection: Bull Mother Experimental Farm, Anjora, Durg, India

Breed name: Sahiwal Cows

Conflict of Interest: None declared

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Ethical Committee Approval Number: Nil

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