The Pharma Innovation

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Non-genetic factors affecting production traits in Gir cattle

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Abstract
Investigation was undertaken to study the effect of non-genetic factors on production traits of 160 Gir cattle during 2012 to 2020 at Gir cattle project of College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur (Rajasthan). The overall least-squares means of Lactation milk yield (LMY), Lactation length (LL), 305 days milk yield (305DMY), Peak yield (PY) and Days to attain peak yield (DPY) were 1546.82±36.06 kg, 273.83±5.01 days, 1839.34±39.53 kg, 10.26±0.14 kg and 32.29±1.11 days, respectively. Period of calving had highly significant ($P \le 0.01$) effect on peak yield and days to attain peak yield. Season of calving had highly significant ($P \le 0.01$) on peak yield and significant effect ($P \le 0.05$) on days to attain peak yield. Parity of animal had highly significant ($P \le 0.1$) on days to attain peak yield and peak yield.

Keywords: Gir cattle, 305DMY, LL, DPY, LMY, PY, Non-genetic factors

1. Introduction
India has the highest cattle population in the world. Success of dairy herds with indigenous breeds depends on production and reproduction performance of animals. Milk production in dairy cow is a function of its genetic makeup and its interaction with environment under which animal is reared and maintained at given time. Gir cattle is one of the best dairy milch breed among Indian cattle breeds. The native tract of Gir cattle is Gir hills and forests of Saurashtra including Bhavnagar, Junagadh, Rajkot and Amreli districts of Gujrat and also in parts of Maharashtra and Rajasthan. Other names of this breed are Bhodali, Desan, Gujarati, Kathiawari, Sorthi etc. in different parts of the breeding tract. Gir cattle have a big head with prominent bulging shield and a long face. The convex forehead (dome shape) of Gir cattle is the most peculiar feature of this breed. Their skin is soft, thin and glossy. It is having long pendulous ears.

2. Materials and Methods
The performance record of 160 Gir cattle during 2012 to 2020 were collected from Gir cattle farm maintained under Gir cattle project of College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur (Rajasthan). The non-genetic factors were divided into three period of calving P1 (2012-2014), P2 (2015-2017) and P3 (2018-2020), three seasons of calving (summer, monsoon and winter) and six parity of animals (1st, 2nd, 3rd, 4th, 5th and 6th & above).
Data were analyzed by least-squares analysis of variance procedures for unequal subclasses (Harvey, 1990) [7] with following statistical model:

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

Where, Y_{ijkl} = is the lth observation pertaining to the trait under focus in the ith period, j^{th} season and k^{th} parity, μ = Population mean, A_i = Fixed effect of ith period of calving (i = 1, 2, 3), B_j = Fixed effect of jth season of calving (j = 1, 2 3), C_k = Fixed effect of kth parity of animal (k = 1, 2, 3, 4, 5, 6 and above), e_{ijkl} = Residual error, NID (0, σ2).
The differences between means were tested for significance by Duncan's Multiple Range Test as modified by Kramer (1956) [9].

$$R_p = r_{\alpha\rho\gamma} \sqrt{MSE/n}$$

Where, Rp = Least significant range for subsets of p sample mean, $r_{\alpha\rho\gamma}$ = Duncun's

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Significant Range Value with parameter p (range-value), γ (MSE degree of freedom) and α (Significance level), n = Sample size for each treatment.

3. Results and Discussion
3.1 Overall least-squares means of production traits
The production traits of Gir cattle are shown in Table 1. The overall least-squares means for production traits were 1546.82±36.06 kg for Lactation milk yield (LMY), 273.83±5.01 days for Lactation length (LL), 1839.34±39.53 kg for 305 days milk yield (305DMY), 10.26±0.14 kg for peak yield (PY) and 32.29±1.11 days for days to attain peak yield (DPY), respectively.

Similar result was reported by Rehman *et al.* (2006) [14] in Sahiwal cattle for lactation milk yield as 1547±36.69 kg. Close agreement to the value reported by Ekka *et al.* (2014) [6] as 1854.18±84.56 kg for first lactation 305day milk yield in Kankrej cattle. The result of present findings were in close agreement for peak yield reported by Ratwan *et al.* (2018) [13] as 10.60±0.31 kg in Sahiwal cattle and Kumar *et al.* (2017) [11] as 10.80±0.16 in Crossbred cattle. Similar result for days to attain peak yield was reported by Zaman (2021) [16] in indigenous cattle of Arunachal Pradesh as 35.97±0.07 days. More close agreement for lactation length reported by Dangi *et al.* (2013) [5] as 267.09±8.04 days in Rathi cattle.

3.2 Effect of non-genetic factors on production traits
The effect of non-genetic factors on production traits in Gir cattle are shown in
Table 1.

3.3 Effect of period of calving on production traits
Statistical analysis of data revealed that period of calving had highly significant (*P*≤0.01) effect on peak yield and days to attain peak yield whereas, non-significant effect on lactation milk yield, 305day milk yield and lactation length in Gir cattle. Similar result of period of calving on peak yield as highly significant effect was reported by Dangar *et al.* (2021) [4] in Gir cattle. Significant effect on days to attain peak yield reported by Bhadoria *et al.* (2002) [3] in Gir cattle. The variation in lactation milk yield observed in different periods indicates difference in management as well as environmental effects. Period of calving causes variation on lactation length due to variation in the climatic conditions, quantity and quality of pasture forages and managemental conditions.

3.4 Effect of season of calving on production traits
Season of calving had highly significant (*P*≤0.01) on peak yield and significant effect (*P*≤0.05) on days to attain peak yield while non-significant effect on lactation milk yield, 305day milk yield and lactation length in Gir cattle. Significant effect of season of calving on peak yield was reported by Baranwal *et al.* (2018) [1] in Gir cattle. Similar result as significant effect of season of calving on days to attain peak yield was reported by Ratwan *et al.* (2018) [13] in Sahiwal cattle. Season of calving causes variation on production traits due to regional difference in the climatic conditions, availability of fodder during various season and classification of season data.

3.5 Effect of parity of animal on production traits
Parity of animal had highly significant (*P*≤0.1) on days to attain peak yield and peak yield whereas, non-significant effect on lactation milk yield, 305day milk yield, lactation length in Gir cattle. Similar results as highly significant effect of parity on peak yield was reported by Dangar *et al.* (2021) [4] in Gir cattle. Significant effect of parity on days to attain peak yield was reported by Zaman (2021) [16] in Indigenous cattle of Arunachal Pradesh.

Table 1: Least-squares means of various production traits (±SE) in Gir cattle

Effect	LMY (kg)	305DMY (kg)	PY (kg)	DPY (days)	LL (days)
Overall	1546.82±36.06 (438)	1839.34±39.53 (163)	10.26±0.14 (438)	32.29±1.11 (438)	273.83±5.01 (438)
Period of calving	NS	NS	**	**	NS
P1 (2012-2014)	1538.30±63.99 (149)	1800.89±70.04 (54)	10.34^{ab}±0.25 (149)	27.24^{a}±1.98 (149)	269.79±8.89 (149)
P2 (2015-2017)	1561.40±50.96 (166)	1894.20±55.80 (65)	9.80^{a}±0.20 (166)	31.83^{a}±1.57 (166)	280.92±7.08 (166)
P3 (2018-2020)	1540.75±55.28 (123)	1822.93±62.36 (44)	10.65^{b}±0.21 (123)	37.80^{b}±1.71 (123)	270.78±7.68 (123)
Season of calving	NS	NS	**	*	NS
S1 (July-Oct.)	1535.07±55.79 (128)	1785.55±58.08 (53)	9.68^{a}±0.22 (128)	35.56^{c}±1.72 (128)	275.67±7.75 (128)
S2 (Nov.-Feb.)	1566.82±55.63 (151)	1926.95±60.03 (56)	10.79^{b}±0.22 (151)	29.78^{a}±1.72 (151)	270.37±7.73 (151)
S3 (March-June)	1538.55±53.39 (159)	1805.51±60.58 (54)	10.32^{b}±0.21 (159)	31.53^{ac}±1.65 (159)	275.44±7.42 (159)
Parity of animal	NS	NS	**	**	NS
L1 (1st)	1529.53±55.67 (130)	1799.77±62.31 (43)	9.51^{a}±0.22 (130)	40.25^{c}±1.72 (130)	270.44±7.73 (130)
L2 (2nd)	1585.98±57.55 (112)	1898.88±60.04 (45)	10.23^{b}±0.22 (112)	34.67^{b}±1.78 (112)	279.15±7.99 (112)
L3 (3rd)	1615.87±66.37 (81)	1844.07±68.80 (33)	10.70^{b}±0.26 (81)	35.33^{bc}±2.05 (81)	279.45±9.22 (81)
L4 (4th)	1548.10±82.47 (60)	1925.05±91.72 (23)	10.66^{b}±0.32 (60)	32.14^{ab}±2.55 (60)	264.84±11.46 (60)
L5 (5th)	1479.84±101.96 (36)	1778.06±115.94 (12)	10.54^{b}±0.39 (36)	28.86^{ab}±3.15 (36)	266.70±14.16 (36)
L6 (6th and above)	1520.67±139.57 (19)	1790.20±151.44 (7)	9.95^{ab}±0.54 (19)	22.50^{a}±4.31 (19)	282.40±19.39 (19)

Note: **= Highly significant (*P*≤0.01), *= Significant (*P*≤0.05), NS= Non-significant (*P*>0.05)

4. Conclusions

The present investigation was focused on the effect of non-genetic factors on production traits in Gir cattle. Significant influence of period of calving, season of calving and parity of animal on these traits would be helpful for further improvement of the breed. The non-genetic factors significantly affect production traits, indicates large variation, which is obvious due to variation in feeding, housing and health care. The effect of calving month suggests that planning of calving season would improve the production efficiency.

5. References

1. Baranwal A, Sagar NG, Pruthviraj DR, Saini BL, Kumar S, Kumar A. Effect of environmental factors on production and reproduction traits of Rindavani cattle. Int. J Livest. Res. 2018;8(6):1964.
2. Basak S, Das DN. Effect of parity, period and season of calving on production and reproduction traits on Deoni cattle. J Anim. Health Prod. 2018;6(1):1-4.
3. Bhadoria HBS, Khan FH, Tomar SS, Yadav MC. Factors affecting peak yield and days to attain peak yield in Gir cows. Indian J Anim. Sci. 2002;72(10):914-915.
4. Dangar NS, Vataliya PH. Factors affecting lactation length and peak milk yield in Gir cattle. Ind. J Vet. Sci. Biotech. 2021;17(01):76-78.
5. Dangi PS, Singh R, Pundir RK, Singh A, Chaudhary V, Verma NK. Study of various performance traits in Rathi cattle. Ind. J Anim. Res. 2013;47(4):321-326.
6. Ekka P, Gupta JP, Pandey DP, Prajapati KB, Patel JB, Shah RR. Genetic analysis of first production and reproduction traits in Kankrej cattle. Ind. J Dairy Sci. 2014;67(3):236-239.
7. Harvey WR. User`s guide for LSMLMW and MIXMDL PC-2 version. Mixed model least squares and maximum likelihood computer program, Ohio State University, Columbus, Ohio, U.S.A., 1990.
8. Kamble VP, Deokar OK, Bhoite UY. Studies on first lactation production traits of Phule Triveni cow. J Agric. Res. Techn. 2016;41(1):135.
9. Kramer CY. Extension of multiple range tests to group means with unequal numbers of replications. Biometrics. 1956;12:307-310.
10. Kumar A, Tomar SS, Sharma H, Rajoriya R. Effect of genetic and non-genetic sources of variation on service period in Gir cows. Ind. J Field Vet. 2014;10(2):54-57.
11. Kumar S, Dalal DS, Yadav AS, Kumar S, Patil CS. Genetic and phenotypic parameters of first lactation performance traits in crossbred cattle–A Review. Int. J Pure Appl. Biosci. 2017;5(5):1352-1359.
12. Raja TV, Gandhi RS. Factors influencing productive and reproductive performance of Sahiwal cattle maintained at organized farm conditions. Ind. J Anim. Sci. 2015;85(6):628-633.
13. Ratwan P, Chakravarty AK, Kumar M, Gupta AK, Lathwal SS, Malhotra R. Production performance and estimation of genetic parameters of production traits in Sahiwal cattle. Ind. J Dairy Sci. 2018;71(6):592-597.
14. Rehman SU, Ahmad M, Shafiq M. Comparative performance of Sahiwal cows at the livestock experiment station Bahadurnagar, Okara Vs Patadar's Herd. Pak. Vet. J. 2006;26(4):179-183.
15. Uddin MK, Wadud A, Begum D, Siddiki MSR, Rashid MH. Productive and reproductive performance of Indigenous and Crossbred cattle in Comilla district. Bangladesh J Anim. Sci. 2008;37(1):39-43.
16. Zaman MKG. Production and reproduction traits of Indigenous cattle of Arunachal Pradesh. J Entomol. Zool. Stud. 2021;9(1):1080-1082.