EVALUATION OF IMPACT OF NON-GENETIC FACTORS ON FIRST LACTATION ATTRIBUTES IN KANKREJ CATTLE

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ABSTRACT

The present investigation was conducted on 274 first lactating Kankrej cattle maintained at Livestock Research Station, Kodamdesar, Rajasthan University of Veterinary and Animal Sciences, Bikaner, calved during the period 2012 to 2022. The research was conducted to evaluate the effect of season and period (non-genetic factors) on first lactation production and reproduction traits in Kankrej cattle. The production and reproduction traits were evaluated as first lactation length (FLL), first dry period (FDP), first lactation total milk yield (FLTMY) and first calving interval (FCI). To estimate the effect of non-genetic factors on production and reproduction traits, computer package programme, IBM SPSS version 26.0 was used for least-squares analysis. The least-squares means estimated for FLL, FDP, FLTMY, FCI were 236.07±8.79 days, 133.76±6.7days, 1416.04±66.45kg, and 427.72±6.79 days, respectively. Season and period of calving had significant effect on first lactation total milk yield (FLTMY).

Keyword: Kankrej, non-genetic factors, season, period.

Introduction

Among the 53 registered breeds of cattle, Kankrej is a dual purpose indigenous breed which takes its name from the name of geographical area i.e. Kankrej taluka of Banaskantha district of Gujarat. It is also known as Wadad or Waged, Vagadia, Talabda, Nagar, Bonnai. The breeding tract is located in the Gujarati districts of Ahmedabad, Banaskantha, Sabarkantha, Kheda, Kutchchh, and Mehsana, as well as a few districts in Rajasthan. Kankrej cattle number is 30.28 lakh, of which 19.45 lakh are purebred and 10.83 lakh are graded. With powerful lyre-shaped horns, it is India's heaviest breed of cattle. The color ranges from silver grey to steel grey, and it has a peculiar gait known as "Sawai Chaal" (NBAGR). In harsh climates of arid and semi-arid regions, Kankrej cattle demonstrate good milk production in addition to greater efficiency in converting poor quality fodder. As it is a dual purpose breed, it makes good milk (Ekka *et al*., 2014; Gupta *et al*., 2019). The average milk production of Kankrej cattle is around 1738 kg, with a fat content ranging from 2.9% to 4.2% (NBAGR, 2019). Due to the economic value associated with production traits in cattle, such as lactation milk yield (LMY), breeding and selection programmes traditionally have been focused on improving them. Information of first lactation trait enables the breeder to predict the later lactation performance of the animals as it is highly correlated with the future performance traits. Hence the present investigation was undertaken to study first lactation productive and reproductive traits of Kankrej cattle.

Material and Methods

The performance record of Kankrej cattle maintained at Livestock Research Station, CVAS, Bikaner was used for the present investigation. Bikaner has a geographical location of East Longitude 28º1' and North Latitude 73º19', situated at an average altitude of 797 Feet, witnesses' extreme temperatures. The climate of the region is characterized as semi-arid where temperature reaches up to 48°C during the summer. To estimate the effect of non-genetic factors on production and reproduction traits, computer package programme, General Linear Model (Univariate) procedure of IBM SPSS (2005) version 26.0 was used for data analysis and determination of least-squares means of the traits considered in the study.

The following statistical model was employed to analyze the data.

$Y_{ijk} = \mu + P_i + S_j + e_{ijk}$

Where,

Y_{ijk} = Observation on the k^{th} cow calved in j^{th} season and i^{th} period,

μ = Overall mean

P_i = Fixed effect of i^{th} period of first calving,

S_j = Fixed effect of j^{th} season of first calving

e_{ijk} = Residual random error associated with each observation under the assumption NID (0, σ^2).

Results and Discussion

The vital economic characteristics of a dairy animal encompass both its capacity to produce and reproduce. These production-related attributes are not solely significant for enhancing genetic quality but are also pivotal for enhancing the overall efficiency and productivity of farm operations.

The influence of non-genetic factors on different first lactation traits has been discussed as follows:

First lactation length (FLL)

The overall least-squares mean for first lactation length (FLL) was estimated as 236.07±8.79 days (Table 1). In the present study it was observed that the season of calving had a non-significant effect on first lactation length of the animals, the animals calved during summer season had higher first lactation length of 258.73±12.04 days than those calved in winter, rainy and autumn seasons where the FLL was observed as 235.47±8.64, 228.99±12.65 and 221.07±13.92 days, respectively. In this study, period of calving had non-significant effect on FLL of the animals, during the period 2019-22 the highest FLL of 258.14±22.98 days was observed compared

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to the periods 2012-2015 and 2016-2018 with least-squares means of 235.28±5.12 and 214.77±8.99 days, respectively.

Many researchers (Manoj, 2009; Kumar and Gandhi, 2011; Raja and Gandhi, 2015; Narwaria *et al*., 2015) have reported a significant effect of period of calving and a non-significant effect of season of calving on FLL whereas Praveen (2016) has found significant effect of season of calving on FLL in Sahiwal cattle.

Table 1: Least-squares means for first lactation length (days) in Kankrej cattle

	No. of Observations	Mean±S.E.
Overall	165	236.07±8.79
Season		NS
Winter	92	235.47±8.64
Summer	26	258.73±12.04
Rainy	28	228.99±12.65
Autumn	19	221.07±13.92
Period		NS
2012-2015	125	235.28±5.12
2016-2018	35	214.77±8.99
2019-2022	5	258.14±22.98

(NS – Non significant)

First dry period (FDP)

The overall least-squares mean for first dry period (FDP) was estimated as 133.76±6.7 days (Table 2). In the present study it was observed that the season of calving had non-significant effect on first dry period of the animals, the animals calved during summer season had lowest first dry period of 129.37±9.05days than those which calved during winter, rainy and autumn seasons wherein the FDP was observed as 134.55±6.47, 134.31±10.96 and 136.80±12.77 days, respectively. In this study period of calving had non-significant effect on FDP of animals, during the period 2012-2015 the lowest FDP of 122.397±4.54 days was observed compared to the periods 2016-2018 and 2019-2022 which are estimated as 137.04±9.4 and 141.84±15.4 days, respectively. Kumar and Gandhi (2011) and Gupta (2013) reported a non-significant effect of season of calving and significant effect of period of calving on FDP, whereas, Raja and Gandhi (2015) and Narwaria *et al.* (2015) have reported a significant effect of season of calving and period of calving in Sahiwal cattle

Table 2: Least-squares means for first dry period (days) in Kankrej cattle

	No. of Observations	Mean±S.E.
Overall	100	133.76±6.7
Season		NS
Winter	61	134.55±6.47
Summer	17	129.37±9.05
Rainy	13	134.31±10.96
Autumn	9	136.80±12.77
Period		NS
2012-2015	80	122.397±4.54
2016-2018	15	137.04±9.4
2019-2022	5	141.84±15.4

(NS – Non significant)

First lactation total milk yield (FLTMY)

The overall least-squares mean for first lactation total milk yield (FLTMY) was estimated as 1416.04±66.45 kg (Table 3). In this study it is observed that the season of calving had significant effect on first lactation total milk yield of the animal, the animals calved in summer season had higher FLTMY of 1628.60±98.01 kg than those calved in winter, rainy and autumn seasons wherein FLTMY observed were 1417.58±63.04, 1343.58±101.28 and 1274.39±110.01 kg, respectively. In the present study the period of calving had a significant effect on FLTMY of the animals, during the period 2019-2022 the highest FLTMY of 1633.12±167.72 kg was observed compared to the animals calved during the period of 2012-2015 and 2016-2018 with least-squares means of 1445.59±42.5 and 1169.4±70.86 kg, respectively.

Raja and Gandhi (2015), Verma *et al.* (2016) and Singh and Singh (2016) have reported a highly significant ($p<0.01$) effect of period of calving and a non-significant effect of season of calving whereas, Narwaria *et al.* (2015) has reported a significant effect of season of calving on FLMY trait in Sahiwal cattle.

Table 3: Least-squares means for first lactation total milk yield (kg) in Kankrej cattle

	No. of Observations	Mean±S.E.
Overall	196	1416.04±66.45
Season		*
Winter	121	1417.58^{ab}±63.04
Summer	26	1628.60^{b}±98.01
Rainy	28	1343.58^{ab}±101.28
Autumn	21	1274.39^{a}±110.01
Period		*
2012-2015	147	1445.59^{ab}±42.5
2016-2018	42	1169.4^{a}±70.86
2019-2022	7	1633.12^{b}±167.72

(*= Significant (P<0.05))

First calving interval (FCI)

The overall least-squares mean for first calving interval (FCI) was estimated as 427.72±6.79 days (Table 4). In the present study it was observed that the season of calving had non-significant effect on first calving interval of the animals, the animals calved during autumn season had lowest first calving interval of 411.16±11.78 days than those which calved during winter, summer and rainy seasons wherein the FCI was observed as 429.06±6.82, 430.92±11.13 and 439.74±11.57 days, respectively. In this study period of calving had non-significant effect on FCI of animals, during the period 2012-2015 the lowest FCI of 424.66±5.05 days was observed compared to the periods 2016-2018 and 2019-2022 which are estimated as 428.53±9.58 and 429.97±15.76 days, respectively.

Table 4: Least-squares means for first calving interval (days) in Kankrej cattle

	No. of Observations	Mean±S.E.
Overall	158	427.72±6.79
Season		NS
Winter	91	429.06±6.82
Summer	22	430.92±11.13
Rainy	24	439.74±11.57
Autumn	21	411.161±11.78
Period		NS
2012-2015	120	424.66±5.05
2016-2018	28	428.53±9.58
2019-2022	10	429.97±15.76

(NS – Non significant)

Kathiravan *et al.* (2009) and Manoj (2009) reported a non-significant effect of season of calving, whereas, Kumar and Gandhi (2011) and Narwaria *et al.* (2015) found a significant effect of season on FCI. Further, Narwaria *et al.* (2015) and Praveen (2016) reported a non-significant effect of period of calving on FCI in Sahiwal cattle.

Conclusion

The significant effect of season and period on FLTMY in Kankrej cows in thepresent investigation indicated that environmental conditions and managemental practices may affect these traits during different periods. Kodamdesar, Bikaner falls under the semi-arid region of western Rajasthan where the rainfall generally very inconsistent from year to year. The effect of period on FLTMY may be attributed to the variation in rainfall influencing the availability of feed and fodder to the animals during different periods. It indicated the necessity for correction of data for estimation of genetic parameters.

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Competing interests

The authors declare that they have no competing interests.

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