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INFLUENCE OF NON-GENETIC FACTORS ON MILK PRODUCTION TRAITS OF JERSEY CROSSBRED COWS IN COASTAL ODISHA

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Abstract- Data representing 254 crossbred Jersey cows from three coastal districts of Odisha in India was analyzed to determine the effects of area, season of calving, economic background of farmer, parity on milk production and age at first calving. The overall least squares mean (LSM) of lactation length (LL), daily milk yield (DMY), lactation milk yield (LMY) and 305 days milk yield (305dMY) were 261.04±2.25 days, 6.39±0.10, 1673.10±30.38 and 1950.60±30.93 kg, respectively. All sources of variation were significant in some parameters or other, except season of calving and age at first calving. Milk production traits were significantly poor for cows reared by economically weaker farmers. It was therefore, concluded that, crossbred Jersey cows were affected by non-genetic factors.

Keywords: Crossbred, Milk production traits, Lactation milk yield, Lactation length, Parity

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Introduction

Dairy sector in the country has emerged as an important source of livelihood for a vast majority of the rural population. According to the 2012 Livestock Census, there are 190.90 million indigenous cattle; 39.73 million crossbred cattle and 108.70 million buffaloes in India. The trend in livestock population (2007 to 2012) shows a distinct shift in composition of milk animal stock in favour of exotic /crossbred cattle and buffaloes, as their numbers increased by 34.78 and 4.95 percent, respectively, while that of indigenous cattle increased only by 0.17 percent compared to previous census [1]. In India, average milk productivity of crossbred cows, indigenous cows and buffaloes are about 7.02, 2.36 and 4.80 kg/day, respectively [2]. In spite of the presence of large and diverse cattle genetic resources with 39 registered breeds, the productivity of cows remains low in the country, for various reasons, such as poor genetic potential, inadequate nutrition, inadequate animal health services, the harsh climatic conditions and other management related problems.

The indigenous cattle breeds are low producers; they mature late and have a delayed conception coupled with long calving intervals. The productivity of dairy animals could be increased by crossbreeding the low yielding nondescript cows with high yielding suitable exotic breeds. This systematic cross breeding of temperate dairy breeds was principally undertaken to combine high milk yield and early sexual maturity of European dairy breeds with hardiness, disease resistance and adaptability of indigenous cattle. Thus, crossbreeding of local non-descript cattle with exotic breeds of high genetic potential has been considered to be a rapid and effective method of improvement.

With the advent of artificial insemination and the limited introduction of cross breeding programme in the hill areas by the Government of India since 1961, official policy started recognizing cross breeding of cattle with European donor breeds, as a possible option for improving milk production. In consonance with national policy, Odisha adopted cross breeding programme as its breeding policy with a view to improve milk production and productivity. National breeding policy advocated for selective breeding in recognized breeds and cross breeding for non-descript cattle. As Odisha did not harbor any recognized native breed till 2010, continued to adopt cross breeding as an 'improver strategy'.

Most states had been totally indifferent in managing the breeding policy as prescribed and no attempt was made by most states to produce proven half-bred bulls. In the absence of evaluated half-bred bulls, inter se mating in many states ran into disrepute, as progenies in successive generations were reported to be producing yields far below the expected levels and by the nineties, the whole of the crossbreeding programme came to be regarded by many as a very expensive misadventure, unsuitable to the farming systems in the country and causing enormous health and management problems to the small holder producers. The condition in Odisha is realized as an alarming issue as evident from the survey that only 12.16% of all the cattle heads are crossbreds, the corresponding figure in coastal area is around 30% and in hilly and interior Odisha it is less than 6% [1].

Keeping in view the above facts, the present study was undertaken to analyze the non-genetic factors affecting milk production traits of crossbred Jersey cows in coastal Odisha..

Materials and methods

Study area

This study was conducted in Puri, Jajpur and Kendrapada districts in Odisha. The area is situated between 19° 87' N to 20° 96' N latitude and between 85° 79' E to 86° 76' E longitude. The climate is hot and moist sub-humid to hot and humid in nature and in the 'south east coastal plain' and 'north eastern coastal plain' agro-climatic

zones in Odisha. The average maximum and minimum temperatures are 39.2^0 C and 14.2^0 C observed in the month of May and January, respectively. The average relative humidity ranges between 37.2 and 86.2 per cent over the months during the year. The average annual rainfall is around 1500 mm. The tract receives maximum amount of rain during the monsoon (month of maximum, June: 386.3 mm). The soil in the native tract is alluvial and coastal alluvial saline near the coastline. This part of Odisha is famous for production of rice, groundnut, mustard, sugarcane and almost all varieties of vegetables.

Management of animals

Cows are hand-milked twice a day, early in the morning (6:00 to 8:00 AM) and late in the afternoon (6:00 to 7:00PM) after feeding kitchen waste/concentrate mixture. Most of the cows are allowed for grazing from 9.00 AM to 5.00 PM. on a regular basis. However, in summer season (March to June) the cows are allowed for grazing from 9.00 AM to 12.00 AM after that the animals are tied and stall-fed with required quantities of dry and green fodder under the shade. Some cows are kept under intensive system and are never allowed to let loose. These cows are fed with some green fodder, dry straw and balanced feed. All the calves are kept along with the dams but not allowed to suckle in the night. Animals are regularly vaccinated against major diseases such as Foot and Mouth Disease (FMD), Black Quarter (BQ) and Haemorrhagic Septicaemia (HS). The milking cows are washed and groomed regularly. They are always fed individually. Upon heat detection, cows are inseminated artificially.

Sources and nature of data

Data representing 254 crossbred (CB) Jersey cows from three districts were collected and organized to study the effects of area, season of calving, economic background of owner, parity on milk production and age at first calving. Puri, Jajpur and Kendrapada districts under survey were decoded as D1, D2 and D3, respectively. D1 harbours more than 30% CB Jersey cows. Corresponding value for D2 and D3 is less than 10%. The complete year was divided into three seasons. The three seasons namely winter (November to February), summer (March to June) and monsoon (July to October) were coded as S1, S2 and S3. Three levels of age at first calving (AFC) were coded as A1 for < 2 years, A2 for 2 to 2.5 years and A3 for > 2.5 years. The parities were partitioned as first lactation (L1), second to fourth lactation (L2) and fifth or more lactation (L3). Economic background of owners was considered on the basis of land holding and was divided into three groups *viz.* less than 1 acre, 1 to 2 acres and more than 2 acres and were coded as E1, E2 and E3, respectively.

Statistical analysis

Data were analyzed by a computer programme for least squares and maximum likelihood model [3]. When the analysis of variance indicated the existence of significant within class, Duncan's Multiple Range Test (DMRT) was employed to test and locate means that significantly differed from the rest by using SPSS10.0.1 version [4].

The following statistical model was employed to analyse the data.

$$Y_{ijklmn} = \mu + D_i + S_j + E_k + L_l + A_{tm} + eijklm$$

where, Y_{ijklmn} – is the lactation length (LL), daily milk yield (DMY), lactation milk yield (LMY) and adjusted milk yield at 305 days (305 dMY) record of n^{th} cow calved in i^{th} area, in j^{th} season, at k^{th} economic standard of farmer, on l^{th} parity and within m^{th} AFC. 'eijklmn' is the random error associated with the measurement, which is assumed to be normally, identically and independently distributed with a zero mean and common error variance. μis the population mean common to all the observations.

Results and Discussion

Performance of dairy animal is judged from the milk it produces during a specified period and in different parity or lactation. Variation is often observed in lactation milk yield from lactation to lactation in the same animal. The main reason of variation primarily attributed to the physiology of lactation is the given set of genes and their reaction with non-genetic factors. The lactation performance of dairy cattle is usually measured by determining total milk yield per lactation or per 305 days, average daily milk yield, lactation length and milk composition.

Comparison of the least squares means (LSM) of different parameters on milk yield potentials as affected by area of survey, season of calving, economic background of farmer, lactation or parity and age at first calving are presented in [Table-1].

The overall lactation length of Jersey crossbred cows was recorded as 261.04±2.25 days with significant effect of parity, making L3 lower than L1 and L2. No significant difference was observed between L1 and L2. All other non-genetic factors under the present study had no significant effect on lactation length of crossbred Jersey cows. Non-significant effect of season on lactation length was reported [5,6] which are in agreement with the present finding.

The average daily milk yield of Jersey crossbred cows was recorded as 6.39±0.10 kg with significant effect of area, economic status of farmers and parity, finding E1 lower than E2 and E3. No significant difference was observed between E2 and E3, which reveals that, better economic status of farmers trigger better management practices, resulting in higher daily milk yield. Second to fourth lactation (L2) had significantly higher daily milk yield than L1 and L3 and non-significant difference was observed between L1 and L3. Season had no significant effect on daily milk yield of the CB Jersey cows under the study. Similar results were also reported [7]. Studies on CB Jersey cows [8,[9] had revealed significant effect of season of calving on daily milk yield, contrary to the present findings.

Table-1 *Comparison of least squares means (LSM) and standard error (S.E) for various milk production traits*

Source	Code	N	LL (days)	DMY (kg)	LMY (kg)	305 dMY (kg)
Overall	μ	254	261.04±2.25	6.39±0.10	1673.10±30.38	1950.60±30.93
Area	D1	71	263.86±4.12	7.36^a±0.18	1958.90^a±58.05	2248.50^a±54.82
	D2	95	261.02±3.71	6.03^b±0.16	1581.90^b±48.98	1837.40^b±49.62
	D3	88	258.77±3.92	6.01^b±0.15	1541.10^b±41.17	1832.40^b±45.46
Season	S1	83	262.49±3.72	6.18±0.17	1631.00±51.44	1879.20±52.18
	S2	123	260.55±3.42	6.60±0.15	1723.80±43.53	2016.50±44.83
	S3	48	259.75±4.98	6.23±0.24	1616.20±73.58	1905.10±72.11
Economic background	E1	138	259.49±3.33	6.15^b±0.12	1592.70^b±37.59	1874.30^b±38.22
	E2	73	260.00±3.91	6.77^a±0.19	1766.40^a±55.74	2065.60^a±59.97
	E3	43	267.78±4.37	6.39^a±0.10	1772.90^a±88.90	2000.20^a±85.16
Lactation	L1	76	267.20^a±3.78	6.09^b±0.14	1616.10^{ab}±40.12	1860^{ab}.00±43.32
	L2	142	260.68^a±2.88	6.69^a±0.15	1756.10^a±45.23	2038.80^a±46.21
	L3	36	249.44^b±7.50	5.86^b±0.21	1466.20^b±71.58	1793.90^b±65.57
AFC	A1	165	259.92±2.87	6.44±0.12	1675.70±36.26	1963.60±37.93
	A2	72	262.12±3.85	6.26±0.18	1639.90±52.04	1909.70±56.01
	A3	17	267.29±9.68	6.53±0.50	1788.80±187.31	1997.00±152.61

N= Number of observations. * Different superscripts differ significantly (P<0.05) within a column with respect to corresponding source.

The overall least squares mean of lactation milk yield was recorded as 1673.10±30.38 kg with significant effect of area, economic status of farmers and parity. Puri district (D1) had significantly better lactation milk yield than other two districts (D2 and D3), which revealed that, popularity of crossbred cows in the area (D1: more than 30% CB cows) must have ensured scientific management practices in livestock sector than the other two districts (D2 and D3: less than 10% CB cows) yielding better value with respect to lactation milk yield. E1 had lower value of lactation milk yield than E2 and E3. No significant difference was observed between E2 and E3, between L1 and L2 and, between L1 and L3. However, second to fourth lactation (L2) had significantly higher daily milk yield than L3. Season and age at first calving had no significant effect on lactation milk yield of the CB Jersey cows under study. Similar results were reported by [10] and [11] in Friesian × Sahiwal and Gir crossbreds, respectively. However, lower milk production was reported in cows calving in summer [12].

The overall least squares mean of 305-day milk yield was recorded as 1950.60±30.93 kg with significant effect of area, economic status of farmers and parity. The average 305 dMY in the present study corroborates the findings of [13,7]. Puri district (D1) had significantly better lactation milk yield than other two districts (D2 and D3) under study. E1 had lower value of 305-day milk yield than E2 and E3. No significant difference was observed between E2 and E3. Non-significant difference was observed between L1 and L2. No significant difference was also observed between L1 and L3. However, second to fourth lactation (L2) had significantly higher dMY than L3. It is in close agreement with the results reported in Karan Fries crossbred cows [14]. Season and age at first calving had no significant effect on 305 dMY of the CB Jersey cows under study. Similar results were reported by [15].

Conclusion

Thus, it is concluded that, non genetic factors do affect the milk production traits in a particular generation. Considering the overall management and limited feed supplementation, the production performance of crossbred Jersey cows owned by farmers with moderate economic status in coastal Odisha is satisfactory in comparison to such animals in other parts of the country. However, better management in general and feeding in particular is essential to harness the optimum genetic potential of CB Jersey cows. In certain cases, it is also reported that, farmers do not harvest optimum yield potentials of the animals due to high feed cost, non-availability of low cost alternative feeds, imperfect market and also other reasons resulting in farmers functioning below 'threshold' level of operation. Accordingly, the ongoing activities to improve and expand crossbred dairy cattle production at smallholder level in the study areas should be encouraged with emphasis in feeding and other management parameters.

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