Performance of farmbred Jersey cattle under tropical climatic conditions of Tamil Nadu

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ABSTRACT

Data on production and reproduction performances of 373 Jersey cows born and reared at the Exotic Cattle Breeding Farm, Eachenkottai, Tamil Nadu, India, pertaining to 27 years were collected. They were analysed to study the effects of various non-genetic factors on milk production and reproduction traits. The least-squares means (± SE) for 305-day and total lactation milk yields for all the parities were 1491.6 ± 25.9 and 1560.9 ± 29.9 kg respectively. The averages for lactation length, service period, calving interval and dry period for all lactations were 303.1 ± 4.0, 177.0 ± 10.0, 461.0 ± 9.7 and 160.2 ± 9.7 days respectively. Years grouped into five periods had significant (P<0.01) influence on all the traits studied. Season of calving showed a significant (P<0.01) source of variation in milk yield traits and calving interval. Parity was found to influence 305-day milk yield, service period, dry period and calving interval significantly (P<0.01). The study revealed that the performance of the Jersey cattle was much lower than those maintained under high altitude conditions in Tamil Nadu and other places in India.

Key words: calving interval, dry period, heritability, milk yield, non-genetic factors

INTRODUCTION

As a policy the system, the cross breeding programme has been adopted to alter the genetic makeup of native zebu stock in the tropics. This tool has had India, transverse a long way in the global scenario of milk production. For cross breeding, bulls of Holstein Friesian, Jersey and other European milch breeds were introduced into India. Among them, the Jersey breed was preferred because of its perceived better adaptability to tropical climate. Importation of either bulls or frozen semen alone could not fulfill the needs of cross breeding programme in India. Hence, a programme of raising bulls within the country was made by establishing bull mother farms at different places. For this, the Government of Tamil Nadu, India imported a herd of 150 pregnant Jersey heifers in 1978 and 1979 in two batches from Australia to produce bulls of high genetic merit and to ensure regular supply of good quality semen. Although investigations have been carried out on Jersey cattle maintained in bull mother farms (Singh and Mishra, 1980; Sadana and Tripathi, 1986; Sreemannarayana and Rao, 1994; Pal *et al.,* 2002; Venkataramanan*et al*., 2007), a detailed study on Jersey cattle maintained under hot and humid climatic conditions of Tamil Nadu is lacking. Hence, an investigation on production and reproduction performances of the Jersey cattle

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born and bred on the farm has been made. This will be useful to understand the performance and the influence of various non-genetic factors affecting the economic traits of Jersey cattle.

MATERIALS AND METHODS

This study was based on the data pertaining to the progeny of imported Australian Jersey heifers and cows born and bred at Exotic Cattle Breeding Farm, Eachenkottai, Tamil Nadu, India from 1980 to 2006 (27 years). This farm is located in the east-coastal region of Tamil Nadu and the climate is generally hot, humid and tropical in nature. The Jersey cattle were housed in permanent sheds with open type ventilation and maintained under stall-fed conditions. Roughages in the farm of green fodder and paddy straw were provided. In addition, concentrate mixture was provided to all age groups as per the standard requirements. Cows were hand-milked twice daily in the morning and evening. Data on production and reproduction performances of farmbred Jersey cattle (1172 lactation records form 373 Jersey cows) were extracted from history and pedigree sheets. The traits studied were 305-day milk yield, lactation length, lactation milk yield, service period, calving interval and dry period. Period and season were the fixed environmental effects considered for all the traits. As the calvings were less in a year, year-season analysis was not done. To utilise all available data, the entire duration of the study was grouped into five periods and each year was classified into four seasons viz. winter (January to February), summer (March to May), south-west monsoon (June to September) and north-east monsoon (October to December). In addition, parity effect was also considered. First six parities were considered and parties six and above were lumped together as sixth parity. LSMLMW and MIXMDL PC-2 VERSION computer programme of Harvey (1990) was used to study the effect of various non-genetic factors. The model used for analysis was $Y_{ijkl} = \mu + P_i + S_j + O_k + e_{ijkl,}$ Where, Y_{ijkl} = the l^{th} observation in i^{th} period, j^{th} season and k^{th} parity, μ= overall mean when equal subclass frequencies exist, P_i = effect of i^{th} period ($_i$ =1 to 5), S_j = effect of j^{th} season ($_j$ =1 to 4), O_k = effect of k^{th} parity ($_k$=1 to 6) and e_{ijkl} = random errors NID (0, σ^2_e). The least-squares means were compared by Duncan's multiple range test.

RESULTS AND DISCUSSION

The least-squares means (± SE) for production traits are presented in Table 1. The milk yield in period 1 (1980-84) was significantly ($P<0.01$) more when compared to other periods. North-east monsoon and winter calvers were found to give the highest milk yield and they were different ($P<0.01$) from summer and south-west monsoon season calvers. Most of the 305-day milk yields reported for locally bred Jersey (Sreemannarayana and Rao, 1994; Pal *et al*., 2002; Ahmed *et al*., 2004; Venkataramanan, *et al*., 2007) was higher than the values observed in the present study. However, Singh and Mishra (1980) reported much lower value of 1176.2 ± 87.49 kg (n=17) for Jersey cattle maintained in Orissa, also a hot and humid region in India. A comparable value of 1399.10 kg was also reported by Sadana and Tripathi (1986) for Jersey cattle maintained at Palampur, Himachal Pradesh, a high altitude region in India. The significant influence of period and season of calving on 305-day milk yield and lactation milk yield in the present study corroborated with the findings of Chauhan (1990) and Murdia and Tripathi (1992). Parity had highly significant effect on 305-day milk yield and significant effect on lactation milk yield. The milk yields were lowest in first lactation and increased with advancement of lactation. Similar results were also reported for Jersey cows maintained in different places in India and Pakistan (Chauhan, 1990; Murdia and Tripathi, 1992; Ahmed *e al.,*2004; Venkataramanan*et al*., 2007). In general, the low productivity of *Bostaurus* in the tropics is attributable to the interaction of a complex group

of factors. Among these are the high atmospheric temperature and relative humidity, low content of essential nutrients in feeds, wide seasonal fluctuations in quantity and quality of feed and high incidence of disease (Mahadevan, 1966)

The least-squares means (± SE) for service period, calving interval and dry period are presented in Table 2. The service period observed was higher than the averages reported for Jersey cows by Jain *et al. (*1999) in India and Sattar*et al*. (2004) in Pakistan. Venkataramanan*et al*. (2007) reported that the calving interval of Jersey cows maintained at Nucleus Jersey and Stud Farm, located in highlands in Tamil Nadu as 416.5 ± 7.2 days and many other studies (Chauhan, 1990; Das *et al.,* 1990; Sattar*et al*., 2004) also indicated lower calving interval than that observed in the present study. However, comparable values were reported in India by Kar*et al*. (1987) and Jain *et al*. (2001). Gogoi*et al*. (1993) reported higher value of more than 530 days for Jersey cattle maintained in Assam, India and indicated the possible cause as the hot and humid climatic conditions. The dry period pooled over parities observed was higher than the value reported by Duc and Taneja (1984). The highly significant effect of period of calving on calving interval observed in the present study corroborated with the reports of Chauhan (1990) and Venkataramanan*et al*. (2007). Some of the studies (Das *et al.,* 1990; Venkataramanan*et al*., 2007) including the present one revealed that the mean calving interval for the first parity was higher than the records pooled over all parities.

The production performance of farmbred Jersey at Eachenkottai was generally distinctly lower than those observed in other parts of India. But the reproduction performance observed is comparable to earlier studies made in bull mother farms located at different places in India. Period and season of calving had highly significant effect on all the production traits studied, which indicated that the animals exposed to different environments during different years and seasons and this might be one of the reasons for poor production performance of the herd.

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Table 1.

Least-squares means (± SE) for different milk production traits of farmbred Jersey cows

Effect	n	305-day milk yield (kg)	Lactation length (days)	Lactation milk yield (kg)
Overall mean (μ)	**1172**	**1491.6 ± 25.9**	**303.1 ± 4.0**	**1560.9 ± 29.9**
Period of calving		**	**	**
P_1 (1980-84)	197	1729.5^{b}± 35.7	331.8^{c}± 5.5	1890.7^{b}± 41.2
P_2 (1985-89)	468	1451.7^{a}± 22.3	315.4^{bcd} ± 3.5	1494.9^{a}± 25.7
P_3 (1990-94)	418	1538.1^{a}± 23.0	304.2^{bd}± 3.6	1579.2^{a} ± 26.5
P_4 (1995-99)	69	1400.6^{a}± 54.5	264.2^{a}± 8.5	1415.8^{a}± 63.0
P_5 (2000-04)	20	1338.3^{a}± 98.3	300.4^{ad}± 15.3	1423.8^{a} ± 113.5
Season of calving		**	**	**
Winter (Jan. – Feb.)	156	1566.5^{b}± 42.6	313.2^{b}± 6.6	1629.8^{bc}± 49.2
Summer (Mar. - May)	305	1383.2^{a}± 32.3	289.7^{a}± 5.0	1453.7^{a}± 37.3
South-west monsoon (Jun. – Sep.)	329	1447.0^{a}± 32.7	301.6^{ab}± 5.1	1523.2^{ac}± 37.8
North-east monsoon (Oct.-Dec.)	382	1570.0^{b}± 32.0	308.2^{b}± 5.0	1636.9^{b}± 36.9
Parity		**		*
First	373	1396.8^{a}± 30.0	299.1 ± 4.7	1469.5^{a}± 35.0
Second	284	1448.7^{a}± 33.5	304.0 ± 5.2	1511.2^{ab}± 38.7
Third	210	1496.5^{a}± 36.7	311.4 ± 5.7	1563.6^{b}± 42.4
Fourth	144	1511.3^{a}± 42.3	303.6 ± 6.6	1597.2^{b}± 48.8
Fifth	87	1537.7^{ab}± 52.4	298.2 ± 8.1	1584.5^{b}± 60.5
Sixth and above	74	1558.8^{b}± 55.5	302.9 ± 8.6	1639.3^{b}± 64.1

n= number of observations. * P<0.05, ** P<0.01.

Means bearing same superscript do not differ significantly.

Table 2.

Least-squares means (± SE) for different reproduction traits (days) of farmbred Jersey cows

Effect	n	Service period	n	Calving interval	n	Dry period
Overall mean (μ)	**829**	**177.0 ± 10.0**	**878**	**461.0 ± 9.7**	**861**	**160.2 ± 9.7**
Period of calving		**		**		**
P_1 (1980-84)	156	170.3^{ab}± 11.4	178	459.8^{bc}± 11.2	168	125.9^{a}± 11.5
P_2 (1985-89)	355	169.1^{a}± 7.3	372	444.6^{ac}± 7.4	366	129.8^{a}± 7.5
P_3 (1990-94)	278	145.3^{a}± 7.9	286	422.2^{a}± 8.1	283	117.7^{a}± 8.2
P_4 (1995-99)	30	235.9^{b}± 22.8	30	515.2^{bd}± 23.5	32	261.7^{bc}± 22.9
P_5 (2000-04)	10	164.4^{a}± 38.9	12	463.4^{acd}± 36.6	12	165.8^{ac}± 36.8
Season of calving				*		
Winter (Jan. – Feb.)	106	199.3 ± 15.3	111	487.2^{b}± 15.1	113	177.7 ± 15.1
Summer (Mar. - May)	208	174.8 ± 11.8	218	460.4^{ab}± 11.7	216	167.1 ± 11.7
South-west monsoon (Jun. – Sep.)	235	170.1 ± 11.9	253	451.1^{a}± 11.7	243	151.9 ± 11.8
North-east monsoon (Oct.-Dec.)	280	163.8 ± 11.9	296	445.5^{a} ± 11.6	289	144.1 ± 11.7
Parity		**		**		**
First	260	208.0^{bd} ± 11.4	288	496.5^{b}± 11.0	283	201.6^{b}± 11.0
Second	205	203.7^{bc} ± 12.0	215	486.0^{ab}± 11.8	210	184.6^{bc}± 11.9
Third	155	183.8^{ab} ± 13.3	159	466.9^{ab} ± 13.1	157	157.6^{ac}± 13.2
Fourth	102	164.2^{ac}± 15.1	106	450.2^{a}± 15.0	104	143.5^{a}± 15.2
Fifth	60	157.3^{acd}± 17.8	61	437.9^{a}± 18.0	60	136.4^{a}± 18.2
Sixth and above	47	145.0^{a}± 20.0	49	428.7^{a}± 20.1	47	137.9^{a}± 20.5

n= number of observations. * P<0.05, ** P<0.01.

Means bearing same superscript do not differ significantly