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Effect of Service Period, Gestation Period and Dry Period on Milk Production Traits in Kankrej Cattle

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Abstract

The present investigation was undertaken to study the effect of non-genetic factors, viz., service period (SP), dry period (DP) and gestation period (GP) on various milk production traits in Kankrej cattle. 1235 lactation records (2^{nd}-7^{th}) of 475 Kankrej cows, progeny of 75 bulls that were maintained at University Livestock Research Station, Sardarkrushinagar (Gujarat), calved during 1980-2014, were studied. The effects of service period (111.64 ± 52.55 days) and dry period (143.17±28.78 days) on total lactation milk yield (2089.45±582.38 kg),305 days milk yield (2045.66±531.92 kg) and lactation length (282.90±49.46 days) were highly significant ($p<0.01$), while the effect of gestation period (288.86±7.14 days) was non-significant on all these production traits. Cows which took more time to conceive after parturition produced more milk with longer lactation length.

Key Words: Milk production traits, Service period, Dry period, Gestation period, Kankrej cow

Introduction

Kankrej is the native breed of north Gujarat and recognized as the best dual purpose breed of India. It is also reared in part of Rajasthan. It is hardy and best adopted to the tropical climate of India due to resistance for tropical diseases, endurance to hot climate, low cost of maintenance, with adequate productive and reproductive capabilities. To obtain a simultaneous improvement in productive and reproductive traits, it will be useful to use a practical measure that combines these traits and shows the overall efficiency of a cow (Tekerlu and Gundogan, 2005). Among reproductive traits, service period plus gestation period is the calving interval. The gestation period is almost fixed, so longer the service period, longer is calving interval and higher is the cost of milk production. Dry period is one of the important management strategies. Another most important economic problem in dairy herds is poor reproductive efficiency, which is positively correlated with productivity. Recently researchers argued that reduction of dry period can improve cow performance regarding milk production and composition, metabolic status and fertility (Gulay *et al.*, 2003; Gumen *et al.*, 2005; De Feu *et al.*, 2009; Watters *et al.*, 2009). Hence, the present study was carried out to analyze the effect of service period, dry period and gestation period on milk production traits in Kankrej cattle.

Materials and Methods

The data on 1235 lactation records of 475 Kankrej cattle sired by 75 bulls maintained at Livestock Research Station of the University at Sardarkrushinagar, Gujarat (India) over a period of 35 years from 1980-2014 were included in the present study. Data of abnormal lactations like abortion, mastitis and below 150 day milk yield, specific or non-specific diseases, reproductive disorders and physical injury were excluded from the study. The service period (SP) was divided into 5 groups as SP 1,2,3,4 and 5 for less than 60 days, 60-90 days, 91-120 days, 121-150 days and more than 150 days, respectively. The gestation period (GP) was divided into two groups as GP 1 and 2 for less than 290 days and more than 290 days, respectively. The dry period (DP) was categorized into three categories as DP1, 2 and 3 for periods of 100-150 days, 151-200 days and more than 200 days, respectively.

The data were analyzed by Mixed Model Least-Squares and Maximum Likelihood (LSMLMW) computer programme developed by Harvey (1990) to obtain the effect of service period, dry period and gestation period on milk production traits. Duncan's multiple range test was used for testing the differences among least squares means, and statistical significance was drawn at 5 and 1 per cent probability.

The following mixed model was used to take the effect of different non-genetic factors on milk production traits:

$Y_{ijkl} = \mu + S_j + D_k + G_l + e_{ijkl}$

Where, Y_{ijkl}= observation of the traits made in ith individual recorded in jth service period and kth dry period by the lth gestation period, μ = population mean, S_j= Fixed effect of jth service period, D_k = Fixed effect of kth dry period, G_l= Fixed effect of lth gestation period, e_{ijkl}= Random effect of residual error.

Results and Discussion

The overall least square means for total milk yield (kg), standard (305 days) milk yield (kg) and lactation length (days) were 2089.45±582.38, 2045.66±531.92 and 282.90±49.46, respectively for 2^{nd}-7^{th} lactation in Kankrej cows studied. In Red Sindhi cattle, Khatri *et al.* (2004) and Muhammad *et al.* (2002) reported lower mean lactation yield (complete life time, i.e. from first to last lactation) as 1060.30±62.26 kg and 1488.40±23.20 kg, respectively, while in Gir cattle Dangar and Vataliya (2015) reported higher estimate of milk yield as 2276.60±171.32 kg. The mean values for service period, dry period and gestation period in Kankrej cows under investigation were 111.64 ± 52.55, 143.17±28.78 and 288.86±7.14 days, respectively, which is in line with the report of Pundir and Ahlawat (2004) in Kankrej cattle but lower to the report of Narwaria *et al.* (2015) in Sahiwal cattle.

Effect of Service Period

The least squares analysis of variance revealed that service period had highly significant ($p<0.01$) effect on total milk yield, standard milk yield and lactation length (Table 1). The milk yield and lactation length of animals conceiving after different time intervals post-partum is given in Table 2. Milk yield of the animals conceiving within 61-150 days after calving did not differ significantly from each other. However, milk yield of the animals conceiving >150 days after calving was significantly higher than the animals conceiving within 150 days after calving but a longer service period is not considered economical (Din and Ahmad, 1987).The milk yield was significantly ($p<0.01$) different among animals conceived with first (<60 days) and fifth (>150 days) service period group. Milk yield and lactation length of service period groups 2, 3 and 4 did not differ from each other. Afzal et *al.* (2007) found non-significant effect of service period on milk production in Murrah buffalo, but the milk yield and lactation length were significantly different in buffaloes conceived at different time after parturition.

Effect of Dry Period : The effect of dry period was significant ($p<0.01$) on total milk yield, standard milk yield and lactation length (Table 1). The total milk yield, standard milk yield and lactation length

were maximum in third dry period and minimum in second dry period (Table 2). Safa et *al.* (2013) reported significant effect of dry period on milk yield in HF cattle.

The change in milk yield with a shorter dry period is variable, suggesting an interaction between the animal's physiology, health and management. However, Annen et *al.* (2004) reported that short dry period reduces milk production in the subsequent lactation in several species; however in cattle, this occurs because of reduced mammary epithelial cell turnover and secretory capacity.

Table 1: Analysis of variance for milk production traits in Kankrej cattle

Source	DF	Mean Sum of Squares		
		Total milk yield	Std. Milk yield	Lactation length
Service period	4	2449115.86**	1655368.73**	34822.19**
Dry period	2	4252108.45**	3877433.24**	21808.21**
Gestation period	1	579269.67^{ns}	756044.38^{ns}	1075.34^{ns}
Error	1227	339169.22	282946.27	2447.053

Table 2 : Period and season-wise Least square means and standard errors in Kankrej cattle

	2089.45±582.38	2045.66±531.92	282.90±49.46
SP 1(<60 days)	1704.71±104.04^{c}	1688.20±95.02^{b}	253.76±8.83^{c}
SP 2(61-90 days)	1906.35±61.23^{ab}	1881.15±55.92^{a}	268.70±5.20^{bc}
SP 3(91-120 days)	1882.83±52.58^{b}	1877.26±48.03^{a}	262.63±4.46^{bc}
SP 4 (120-150 days)	2013.55±45.02^{ab}	1982.74±41.12^{a}	276.19±3.82^{b}
SP 5(>150days)	2178.24±26.29^{a}	2115.56±24.01^{a}	292.79±2.23^{a}
DP 1(100-150 days)	2133.59±33.55^{a}	2072.15±30.64^{a}	280.84±2.84^{b}
DP 2(151-200 days)	1994.82±43.90^{b}	1951.21±40.10^{b}	274.17±3.72^{b}
DP 3(>200 days)	2111.58±44.97^{a}	2085.34±41.07^{a}	292.99±3.81^{a}
GP 1(<290 days)	2108.22±33.10^{a}	2066.77±30.23^{a}	284.04±2.81^{a}
GP 2(>290 days)	2057.29±37.25^{a}	2009.51±34.02^{a}	282.01±3.16^{a}

$^{a, b, c}$ Means with the same superscript do not differ significantly ($p<0.01$).

Effect of Gestation Period

The effect of gestation period was non-significant on total milk yield, standard milk yield and lactation length (Table 1, 2). Milk yield and lactation length did not differ significantly in Kankrej cattle having more than or less than 290 days of gestation period. Roche (2003) reported that in cows the pregnancy related reduction in milk yield occurred after mid gestation, overall effect of pregnancy on milk production was small.

Conclusions

It is concluded that the service period and dry period significantly and positively affected the milk production traits in Kankrej cattle; the cows which take more time to conceive after parturition, will produce more milk with longer lactation length. Gestation period had no effect on milk production traits. Kankrej cattle with more dry period (>200 days) produce more milk in next lactation However,

if a cattle is selected on the basis of longer service period and dry period, will increase the generation interval for next calving and cost of feeding and maintenance of animal. If the Kankrej cattle is selected on the basis of gestation period neither increases nor decreases the milk production.

Conflict of Interest: All authors declare no conflict of interest.

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