

## Study of Milk Production Traits of Rathi Cattle Under Organized Farm Management Conditions in Rajasthan

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#### ABSTRACT

A study was conducted on the performance records of 524 Rathi cattle maintained at Livestock Research Station, Department of Animal Breeding and Genetics, College of Veterinary and Animal Science, Bikaner and 892 Rathi cattle maintained at Livestock Research Station, Nohar, Hanumangarh district. To take account for genetic as well as environmental trend, the whole data were grouped into four periods according to date of birth for age at first calving as P1 (1974-1983), P2 (1984-1988), P3 (1989-1993) and P4 (1994-2002) assuming that yearly variations within the period were minimum. The whole data were grouped into four periods according to date of calving as P or PI (1978-1987), P2 or PII (1988-1993), P3 or PIII (1994-1997), P4 or PIV (1998-2008). The three seasons were summer S1 (March to June), monsoon S2 (July to October) and winter S3 (November to February). The overall Standard Lactation Milk Yield (SLMY) was observed to be  $1726.08 \pm 112.621$  L, peak yield  $9.02 \pm 0.066$  L, lactation length  $275.49 \pm 4.655$  days, dry period  $154.46 \pm 5.530$  days in the present investigation. The effect of period of calving on lactation yield and the effect of on lactation length was found to be highly significant ( $P \leq 0.01$ ). The study suggested that period of calving and season of calving affects lactation yield and lactation length respectively in Rathi cattle.

India is highest milk producing country in the world with 127.2 million tonnes production of milk annually (Department of Livestock Census 2012 Govt. of India). The cattle population in India is about 199.08 million, which comprises of about 16.5 percent of total world cattle population. There are 33.06 million crossbred cattle and 166.02 million indigenous cattle in India (Livestock Census, 2007). The major contributor towards overall milk production has been northern region followed by western, southern and eastern region<sup>[1]</sup>. Rajasthan has got 6.56% of total cattle population of India. Among different species of livestock, the proportion of cattle, buffalo, sheep and goat is 20.98, 19.51, 19.07 and 36.98 percent, respectively. The population of indigenous cattle has increased by 8.79 percent between the years 2003 and 2007 after a previous decrease of 12.9 percent<sup>[2]</sup>. The majority of cattle population in north-western part of Rajasthan especially in Bikaner and Sri-ganganagar districts, is represented by Rathi cattle. By virtue of its good milk potential and adaptability in the desert and draught prone areas, it has drawn attention of animal breeders.

Rathi cattle is a distinct, relatively unknown breed that possesses good potential with high degree of variability for milk production and has not yet been fully explored for its production potential. There is need to exploit the genetic potential of this breed that is well known for its hardiness to withstand the harsh agro-climatic conditions especially in the drought prone area viz arid and semi-arid zone. Rathi animals can produce to their full potential even when maintained on dry fodder available in arid regions. Genetic improvement of Rathi cattle through selective breeding is of paramount importance for conservation, propagation and improvement of this valuable germplasm as a part of national heritage.

The life time performance traits, viz. herd life, number of lactation, life time milk yield, days in milk, etc., are indicative of life

time production efficiency. The information on these aspects is vital for planning and monitoring breeding program for increased profitability from Rathi cows. It is, therefore, important to determine the variability in these economically important traits and their components to explore profitability through genetic improvement. Keeping in view, the lack of knowledge in Rathi breed of cattle, the present study was undertaken to study the milk production traits of Rathi cattle under organized farm management conditions in Rajasthan.

## MATERIALS AND METHODS

The performance records of Rathi cattle maintained at Livestock Research Station, College of Veterinary and Animal Science, Bikaner and Livestock Research Station, Nohar, District Hanumangarh were used for present investigation. At the both farm, the animals were stall fed except for short period during rainy season during which the animals were sent for grazing. The standard feeding schedule based on age, production level, stage of pregnancy and other physiological conditions were followed. Roughage fed to all animals was chaffed. Common dry grasses are available at farm like Sewan, Anjan grass, Bhurat, Karad and Chaffed wheat straw. Seasonal green fodders in the form of Jowar, Bajra, Berseem, Rijka, Jai, etc., were fed to animals due to availability of water of Indira Gandhi Canal (Rajasthan canal) in this tract. The concentrate ration containing 15% DCP and 70% TDN was fed to milking animals at the rate of 0.5 kg per litre of milk produced over and above maintenance ration. All the animals at the farms were maintained under uniform managemental conditions.

The information from the both farm was recorded from history-cum-pedigree sheets on date of birth, date of service, date of calving, date of dry, date of disposal, size of the cow, dam of the cow, parity, lactation milk yield and 300 days milk yield. Milk records of cows, which took birth during the year 1974 to 2002 and calved during the year 1982 to 2008, were included in the present study. The traits included in the present study are Standard Lactation Milk Yield (SLMY), Peak Yield (PY), Lactation length (LL) and Dry period (DP) with number. The data were classified according to farm, season, period and parity as follows:

The total lactations were 1416 in the present study. To study the effect of season of birth on production traits, each year was divided into three seasons according to the climatic conditions like temperature and humidity, considering the month wise averages of minimum and maximum temperature and humidity over the years the seasons were classified as follows summer S1 (March to June), monsoon S2 (July to October) and winter S3 (November to February).

To evaluate the effect of period of calving on various production traits, the whole data were grouped into four periods according to date of calving as P1 (1977-1985), P2 (1986-1994), P3 (1995-2003) and P4 (2004-2011). To study the effect of parity on production and reproduction traits, parity was classified into five groups viz. Parity 1, Parity 2, Parity 3, Parity 4 and Parity 5 and above. For statistical analysis Harvey LSML Model were used. The following mathematical models Harvey LSML Model were used to explain the effect of non-genetic factors:

$$Y_{ijklm} = \mu + F_i + P_j + S_k + L_l + e_{ijklm}$$

Where,

$Y_{ijklm}$  is the  $m^{\text{th}}$  observation in the  $l^{\text{th}}$  parity belonging to  $k^{\text{th}}$  season of  $j^{\text{th}}$  period and  $i^{\text{th}}$  farm effect

$\mu$  is the overall mean

$F_i$  is the effect of  $i^{\text{th}}$  farm (level 2)

$P_j$  is the fixed effect of  $j^{\text{th}}$  period (level 4)

$S_k$  is the fixed effect of  $k^{\text{th}}$  season of birth (level 3)

$L_l$  is the effect of  $l^{\text{th}}$  parity (level 5)

$e_{ijk}$  is the residual random error under the standard assumption that makes the analysis valid, i.e., NID ( $0, \sigma^2 e$ ).

## RESULTS AND DISCUSSION

The least-squares means with standard error for different farm, period of calving, season of calving and parity with overall means are given in **Table 4.1**.

The overall yield was observed to be  $1726.08 \pm 112.621$  L. The effect of period of calving on lactation yield was found to be highly significant ( $P \leq 0.01$ ). Fourth period is having highest SLMY ( $1851.97 \pm 26.728$  L) which is in agreement with by Joshi <sup>[3]</sup> in Rathi and its crosses. The standard lactation milk yield was highly significantly ( $P \leq 0.01$ ) influenced by parity supported by Tikam Chand <sup>[4]</sup> in Tharparkar. Significant effect is indicating better contribution of parity to the total variability of lactation yield. In this study effect of farm on milk yield was found to be non-significant.

The overall least-squares mean of peak yield was estimated as  $9.02 \pm 0.066$  L which are in close agreement to the values reported by Singh, <sup>[5]</sup> and Kumar, <sup>[6]</sup> in Rathi cattle. The effect of period of calving was found to be statistically highly significant ( $P \leq 0.01$ ). Tikam Chand <sup>[4]</sup> in Tharparkar cattle observed significant effect of period of calving on peak yield. The maximum peak milk

yield was found to be  $9.14 \pm 0.093$  L in third (winter) season and minimum was  $8.83 \pm 0.127$  L in second (rainy) season. Effect of parity was observed to be non-significant whereas parity third got peak yield as  $9.25 \pm 0.143$  L which was highest and lowest in parity first was  $8.80 \pm 0.128$  L. Non-significant effect of parity on peak yield was also reported in Sahiwal cattle. Effect of farm was observed to be non-significant indicating similar managerial practices in both farms

The mean of lactation length was estimated to be  $275.49 \pm 4.655$  days. Joshi<sup>[3]</sup>, Nehra<sup>[7]</sup> and Kumar<sup>[6]</sup> estimated lactation length as 305.95 and 295.5 days, respectively, in Rathi cows the effect of period of calving was observed to be significant on lactation length. In the present study the lactation lengths in second and third periods were significantly higher than first and fourth periods. This might be due to favorable climatic conditions and good managerial practices at the farm in those periods. The comparable results of significant effect of periods on lactation length have also been reported by Gahlot<sup>[8]</sup> in Rathi, Chawla and Mishra<sup>[9]</sup> in Sahiwal and Tikam Chand<sup>[4]</sup> in Tharparkar cattle.

In the present study the effect of season of calving on lactation length was found to be highly significant ( $P \leq 0.01$ ). This is in agreement with the findings of Kachwaha<sup>[10]</sup>, Joshi<sup>[3]</sup>, Nehra<sup>[7]</sup> and Kumar<sup>[6]</sup> in Rathi, Pannervelton et al. (1990) in Tharparkar cattle. In the present study the effect of parity on lactation length was found to be highly significant ( $P \leq 0.01$ ). This is in agreement with the findings of Nehra<sup>[7]</sup> in Rathi cattle. The effect of farm on lactation length was found to be Non-significant. This is in agreement with the findings of Naidu and Desai<sup>[11]</sup>.

The dry period of Rathi cows was observed to be  $154.46 \pm 5.530$  days in the present investigation. It is almost similar to the estimate reported in Red Sindhi cows. The cows calving in first and second periods exhibited longer dry period as compared to cows calving in preceding two periods which differ with each other. Shorter dry period was observed in the fourth period ( $144.68 \pm 13.186$  days). Similar trends were reported by Gahlot<sup>[8]</sup> in Rathi cattle and Tikam Chand<sup>[4]</sup> in the Tharparkar cattle. The seasonal influences at calving time on dry period were observed to be non-significant. There was non-significant difference in dry periods due to parity. Fourth parity dry period was highest ( $170.91 \pm 13.841$  days) and in fifth parity it was lowest ( $136.88 \pm 13.972$  days). Similar findings were reported by Dalal et al.<sup>[12]</sup>, Chopra<sup>[13]</sup>, and the farm effect significantly influenced the dry period. Dry period was lower in the cows of Nohar farm than those of Bikaner farm. This might be due to favorable conditions at the farm Nohar. The comparable results of significant effect of farm on dry period have also been reported by Nehra<sup>[7]</sup> in Rathi.

From the Present study in nutshell it may be concluded that good environmental control, improved nutritive quality of fodder, balance feeding good reproductive management and regular culling pattern. On the basis of reproductive fitness helps in reducing the calving interval, days to attain peak yield, dry period, service period of the cows.

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