EFFECT OF NON GENETIC FACTORS ON AGE AT FIRST CALVING IN JAFFARABADI BUFFALOES

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Abstract: The breeding records of 191 primipara Jaffarabadi buffaloes spread over 1991 to 2014 from Cattle Breeding farm, Junagadh were used to study the effects of periods and seasons of calving on age at first calving. The data were collected and analysed using maximum likelihood and least square techniquesto examine the effect of non-genetic factors on age at first calving. The overall least squares mean for Age at fist calving was 1788.52 ± 36.14 days. The effect of season of calving and period of calving were highly significant (p<0.01) on age at first calving. Therefore, the data for genetic analysis should be adjusted for better estimates of genetic parameters in Jaffarabadi buffaloes.
Keywords: Age at first calving, Jaffarabadi buffalo, non-genetic factors.

Introduction

India ranks first in Livestock Population in the world with 512.05 million heads. Buffaloes are regarded as a good option to dairy breeding, because of their potential milk production in distinct environmental conditions and market value of its milk. India is the treasure house of world's best buffalo germplasm with the population of about 108.7 million in 2012, which was about 57.3 percent of total buffalo population of the world, (DAHDF, 2013). India has continued to be the largest milk producing country in 2014-15 with an anticipated milk production of 146.3 million tonnes. The country's share in world milk production stands at 18.5 percent and buffaloes contribute 51 percent of total milk yield of the country, even though they are less in number than cattle (DAHDF, 2016). About 63% of the world's buffalo milk and 95% of buffalo milk in Asia is contributed by Indian buffaloes (FAO, 2012). Jaffarabadi is considered to be one of the best dairy buffalo breed in India. They are the heaviest and massive type of riverine buffalo. They are good milker and thrive well on natural grazing due to their greater feed conversion efficiency. The native breeding tract of Jaffarabadi buffalo is Saurashtra region of Gujarat, viz. Junagadh, Bhavanagar, Jamnagar,

Amreli, Gir Somnath, Rajkot and Morbi district as well as some part of Surendranagar district. It is also known as *"Bhavnagri", "Gir" or "Jaffari"* by the local people.

The age at first calving (AFC) is an important parameter in reproductive efficiency. Age at first calving is a controversial point not only among the farmers but also among many animal breeders as they feel that too early age at first calving, has an adverse effect on the future performance of animals. Even though cattle occupy an important place in the agricultural economy of India, so far as milk production is concerned, the buffalo has taken her place as a milk producing animal. Raising heifers is the most expensive component of the dairy farm operations. Poor growth rate resulting in delayed age at maturity in our local dairy animals further aggravates the situation. However, cost of heifer production can be reduced through better management, balanced feeding, use of performance modifiers and better health care. The shorter the age at first calving the longer shall be productive life.

Considering this background, present study intended to evaluate effects of various non-genetic factors on age at first calving, which will help to formulate suitable evaluation procedures as it is expected that animals with early sexual maturity in terms of AFC may also initiate physiological functioning of reproduction and milk production earlier.

Material and methods

The records on 191 primipara Jaffarabadi buffaloes maintained at cattle breeding farm, Junagadh agricultural University, Junagadhspread over aperiod from 1991 to 2014 were analysed to study the effects on non-genetic factors on age at first calving in Jaffarabadi buffaloes.

The collected data were classified and coded into 5 different periods: Period I (1991-1995), Period II (1996-2000), Period III (2001-2005), Period IV (2006-2010) and Period V (2011-2014) and each year was divided into 5 different seasons: rainy, autumn, winter, spring, summer in order to assess the effect of non-geneticfactors on age at first calving.

The influence of various non genetic factors on age at first calving were studied using least square analysis technique described by Harvey (1986). The statistical model used for age at first calving is given below:

$$Y_{ijk} = \mu + a_i + b_j + e_{ijk}$$

Where,

Y_{ijk}	= Observation on the lth individual in i^{th} season, j^{th} period
μ	= Overall population mean
a_i	= Effect of ith season of calving (i = 1 to 5)
b_j	= Effect of jth period of calving (i = 1 to 5)
e_{ijk}	= Random error, NID $(0, \sigma_e^2)$

Duncan's multiple range test as modified by Kramer (1957) was used for testing significant differences among least squares means.

Results and discussion

The age at first calving is an important economical traitregarding reproduction. The results of analysis of variance for AFC are detailed in Table 1 and the least-squares means for AFC in different seasons of calving and periods of calving are detailed in Table 2.

Table 1: Analysis of Variance of Age at first calving

Source of variation	d.f.	SS	MSS	F
Season of calving	4	1586127.9902	396531.9975	4.585**
Period of calving	4	2374053.5521	593513.3880	6.862**
Remainder	182	15741535.6582	86491.9542	
Total	191	19982962.9529		

**significant at 1% level (P<0.01)

Effect of periodon AFC

The overall means for AFC was 1701.98±324.30 days (Table 2). Period of birth had a statisticallysignificant (P<0.01) on AFC (Table 1). The findings in the present study were in agreement with Johari and Bhatt (1979). Charlini and Sinniah (2015) also reported that the age at first calving was influenced by breed and year of calving. However, Jamuna *et al.* (2015) reported a non-significant effect of period on age at first calving.

Table 2: Least squares means of Age at First calving in Jaffarabadi buffaloes

Effect	N	Mean ± SE (in days)
Overall	191	1788.52 ± 36.14
Season of calving		
Summer	6	2025.48 ± 121.02[d]
Rainy	119	1671.45 ± 30.29[a]
Autumn	37	1855.68 ± 49.35[c]
Winter	21	1762.07 ± 65.19[b]
Spring	8	1627.93 ± 105.65[a]
Period of calving		
1991 – 1995	34	1631.92 ± 59.97[a]
1996 – 2000	17	2023.80 ± 72.18[c]
2001 – 2005	37	1780.68 ± 58.50[b]
2006 – 2010	55	1838.71 ± 52.53[b]
2011 – 2014	48	1667.51 ± 53.28[a]

Means with same superscript did not differ significantly

Effect of seasonof calving on AFC

The season of calving has a highly significant (P<0.01) effect on age at first calving (Table 1). Similarfinding werereported by other workers (Dutt *et al.,* 2001 and Jamuna *et al.,* 2015). Kanaujia *et al.* (1974) also reported highly significant effects of season of year on age at first calving. However, differences between seasons were non-significant for AFC were reported by several workers (Jain and Taneja, 1982, Johari and Bhatt, 1979 and Reddy and Mishra, 1980)

Conclusion

The age at first calving in Jaffarabadi buffaloes were significantly influenced by period and season of calving. The difference in AFC over different period and season may be attributed to differences in feeding, management practices and differential culling level. Therefore, non-genetic variation should be taken into consideration when developing models to be used in adjusting data to provide best estimates of genetic parameters in Jaffarabadi buffaloes.

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