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Effect of age at first calving on productive herd life, longevity and lifetime calf production in Kankrej cow at organised farm

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Abstract

Kankrej cattle at an organised farm were studied to determine the effect of age at first calving on productive herd life, longevity, and lifetime calf production. This study examined the history sheets of Kankrej cattle spread over a period of 15 years (2001-2015) at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat, located in semi-arid Banaskantha District of North Gujarat region with longitude 72.59° East and latitude 24.35° North. The least-square mean for productive herd life (days), longevity (days), number of calves born to each cow, number of female calves born to each cow and number of female calves reaching milking herd from each cow were 1351.99 ± 114.55 , 2592.56 ± 115.02 , 3.21 ± 0.25 , 1.56 ± 0.17 and 1.09 ± 0.14 , respectively. It was observed that age at first calving had no significant effect on the productive herd life, longevity, number of calves born per cow, number of female calves born per cow, number of female calves reaching milking herd per cow.

Keywords: Age at first calving, herd life, longevity, Kankrej, calf production

Introduction

Dairy cattle are continuously developing at a slower rate through selective breeding in order to preserve long-term qualities. An animal breeder's ultimate objective is to maximise return for each unit of input used over a cow's lifespan. Based on lifetime performance, the whole production of dairy cows is taken into account. The calf crop, lifetime milk output, and herd replacement are all impacted by longevity. A long productive life raises the percentage of highly developed animals in the herd, decreases the need for herd replacement, and lowers replacement costs (Asker *et al.*, 1954) ^[4]. From an economic standpoint as well as for breed development, dairy cattle's longevity is a crucial trait (Plowman and Gaalaas, 1960) ^[25]. It is crucial to research how the age at first calving (a nongenetic factor) affects productive herd life, longevity, and lifetime calf production traits in Kankrej cattle because there is a lack of knowledge regarding the impact of age at first calving on these traits, especially in cattle from the semi-arid region of North Gujarat.

Materials and Methods

The relevant data for the present investigation generated over a period of 15 years (2001-2015) were collected from the history sheets and pedigree sheets maintained at Livestock Research Station, Sardarkrushinagar, Dantiwada Agricultural University, Sardarkrushinagar, Gujarat which was initially set up to evaluate production potential of Kankrej Cattle a native breed of Gujarat state. The breeding data collected were used to calculate certain parameters *viz.* the productive herd life, longevity, and lifetime calf production of each Kankrej cattle. The traits under study were defined as follows:

(a) Productive herd life

It is defined as the number of days in milk from the date of first calving to the date of disposal.

(b) Longevity

It is defined as number of days from the date of birth to date of disposal of cows from herd either due to culling or death.

(c) Lifetime calf production traits

The number of calves born to each cow, number of female calves born to each cow during its lifetime and number of female calves reached to the milking herd that is survival to their age at first calving from each cow in its lifetime were included. The age-at-first calving groups of Kankrej cattle were created by using the class interval of 150 days in order to evaluate the influence of age-at-first calving on genetic parameters. Animals were categorised into following 5 groups:

A1: Less than 1001 days

A2: 1001 to 1150 days

A3: 1151 to 1300 days

A4: 1301 to 1450 days

A5: Above 1451 days

To investigate the effect of above-mentioned factor that is age at first calving, on the productive herd life, longevity and lifetime calf production in Kankrej cattle, the data were analysed by least squares analysis of variance techniques with the Harvey statistical model (1990).

Results and Discussion

The least squares means and their standard error were estimated for different age at first calving groups for each trait. The results of present study have been presented in Table 1 and discussed objective-wise.

(a) Effect of age at first calving on productive herd life

The age at first calving was found non-significant effect on productive herd life in the present study of Kankrej cattle. Similar results were reported by Dickerson and Chapman (1940)^[9] in crossbred, Alim (1957)^[2] in Buffalo, El-Barbary (1983a)^[11] in Egyptian cow, Camacho *et al.* (1985)^[7] in Brahman cow, Mahdy (1994a)^[22] in Egyptian buffalo, Bhattacharjya *et al.* (2000)^[6] in Tharparkar, Ram and Goswami (2005)^[31] in Tharparkar, Abbas and Sachdeva (2008)^[1] in Sahiwal, Kumar *et al.* (2009)^[21] in Haryana, Updhyay *et al.* (2015)^[30] in Sahiwal.

Significant effect of age at first calving on productive herd life was also reported by Singh and Sinha (1960)^[29] in Tharparkar, Aroeira *et al.* (1977)^[3] in Gir and Nellore, Hibner and Krzywda (1981)^[15] in Polish Black and White Lowland cattle, Muresan *et al.* (1986)^[24] in Holstein Friesian, Dentine *et al.* (1987)^[8] in Holstein Friesian, Durocq *et al.* (1988)^[10] in dairy cow, Ponce de Leon and Guzman (1988)^[26] Holstein Friesian, Sahota and Gill (1990)^[28] in Sahiwal, Rogers *et al.* (1991)^[27] in Jersey, Gahlot *et al.* (2001)^[12] in Tharparkar, Atrey *et al.* (2005)^[5] in Frieswal, Kumar (2007)^[19] in Haryana, Jakhar *et al.* (2010)^[17] in Haryana, Kumar *et al.* (2014)^[20] in Frieswal, Goshu *et al.* (2014)^[13] in Holstein Friesian.

The study also showed that cows that calved at a younger age were more likely to have higher milk yields, which may suggest that the age at first calving has an effect on productivity. It was, however, not found statistically significant that this effect had an impact on herd productivity, meaning nutrition and genetics probably played a greater role.

(b) Effect of age at first calving on longevity

In the present study a non-significant effect of age at first calving on longevity of Kankrej cow was observed. Similar results were reported by Asker *et al.* (1954)^[4] in Egyptian cattle and Egyptian buffalo, Singh and Sinha (1960)^[29] in Tharparkar, Ibeawuchi (1993)^[16] in Wadara (Shuwa), Bhattacharjya *et al.* (2000)^[6] in Tharparkar, Abbas and Sachdeva (2008)^[1] in Sahiwal, Kumar *et al.* (2009)^[21] in Haryana, Jakhar *et al.* (2010)^[17] in Haryana, Goshu *et al.* (2014)^[13] in Holstein Friesian, Updhyay *et al.* (2015)^[30] in Sahiwal.

On the other hand, a significant effect of age at first calving on longevity was reported by Hibner and Krzywda (1981)^[15] in Poland Black and White Lowland Cattle, Ponce de Leon and Guzman (1988)^[26] Holstein Friesian, Mahdy (1994a)^[22] in Egyptian buffaloes, Gahlot *et al.* (2001)^[12] in Tharparkar, Ram and Goswami (2005)^[31] in Tharparkar, Kumar (2007)^[19] in Haryana, Kumar *et al.* (2014)^[20] in Frieswal.

This could be due to the fact that cows from the same genetic pool were used in this study, and so the effect of age at first calving on longevity of Kankrej cow was likely overshadowed by the effects of genetics.

(c) Lifetime calf production traits

(i) Effect of age at first calving on the number of calves born per cow

In the present study a non-significant effect of age at first calving on number of calves born per cow of Kankrej cow was observed. Similar results were reported by Dickerson and Chapman (1940)^[9] in Cattle, Singh and Sinha (1960)^[29] in Tharparkar, Atrey *et al.* (2005)^[5] in Frieswal, Ram and Goswami (2005)^[31] in Tharparkar, Abbas, and Sachdeva (2008)^[1] in Sahiwal.

On the other hand, significant effect of age at first calving on number of calves born per cow were reported by Mukherjee and Tomar (1996)^[23] in Brown Swiss cross, Kumar *et al.* (2009)^[21] in Haryana, Jakhar *et al.* (2010)^[17] in Haryana, Goshu *et al.* (2014)^[13] in Holstein Friesian.

In other words, the cow's genetics, the environment in which it is raised, and the quality of care it receives are more influential in determining how many calves it can produce over the course of its lifetime, rather than when it first calves.

(ii) Effect of age at first calving on number of female calves born per cow:

In the present study a non-significant effect of age at first calving on number of female calves born per cow of Kankrej cow was observed. Similar results were observed by Kumar (1997)^[18] in crossbred, Atrey *et al.* (2005)^[5] in Frieswal, Abbas and Sachdeva (2008)^[1] in Sahiwal, Kumar *et al.* (2009)^[21] in Haryana, Goshu *et al.* (2014)^[13] in Holstein Friesian.

On the other hand, significant effect of age at first calving on number of female calves born per cow was reported by Mukherjee and Tomar (1996)^[23] in Brown Swiss cross, Ram and Goswami (2005)^[31] in Tharparkar, Jakhar *et al.* (2010)^[17] in Haryana.

It is also possible that the different age groups of cows had different genetic backgrounds and thus may have produced different gender ratios.

Table 1: The least Squares Means and standard error for PHL, L, NC, NFC & NFRMH across different groups of age at first calving (non genetic factor)

Age at first calving	n	Mean±S.E.				
		PH	L	NC	NFC	NFRMH
A ₁	7	1874.37±365.75	2819.26±367.27	4.23 ^c ±0.82	2.38±0.54	2.27±0.45
A ₂	43	1351.19±161.16	2438.24±161.83	3.24 ^{ab} ±0.36	1.54±0.24	0.90±0.20
A ₃	79	1341.03±128.50	2558.36±129.04	3.27 ^b ±0.29	1.65±0.19	1.07±0.16
A ₄	69	1281.88±140.52	2653.74±141.11	3.04 ^a ±0.31	1.35±0.21	0.78±0.17
A ₅	53	911.47±158.25	2493.16±158.91	2.24 ^a ±0.35	0.89±0.23	0.42±0.19

Means with different superscripts differed significantly ($p < 0.01$) in a row; PHL = Productive herd life, L= Longevity, n = Number of observations, NC = Number of calves born per cow, NFC = Number of female calves born per cow, NFRMH = Number of female calves reaching milking herd per cow.

(iii) Effect of age at first calving on the number of female calves reaching milking herd per cow

In the present study, a non-significant effect of age at first calving on number of female calves reaching the milking herd per cow of Kankrej cow was observed. Similar results were reported by Kumar (1997)^[18] in crossbred, Atrey *et al.* (2005)^[5] in Frieswal, Ram and Goswami (2005)^[31] in Tharparkar, Abbas and Sachdeva (2008)^[1] in Sahiwal, Kumar *et al.* (2009)^[21] in Hariana, Goshu *et al.* (2014)^[13] in Holstein Friesian.

On the other hand, significant effect of age at first calving on number of female calves reaching milking herd per cow was reported by Mukherjee and Tomar (1996)^[23] in Brown Swiss cross, Jakhar *et al.* (2010)^[17] in Hariana.

Factors such as nutrition and breed can play a larger role in the number of female calves that reach the milking herd than age at first calving. This is because nutrition can affect the health of the cow and her calf, while breed can affect the size and vigor of the calf. Both of these factors can have a larger impact on the number of female calves that reach the milking herd than age at first calving.

Conclusion

Kankrej cattle having age at first calving less than 1000 days may be selected for higher productive herd life, longevity and lifetime calf production.

It may be concluded from the present investigation that age at first calving plays a very important role for selection of productive animals.

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