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Effect of first lactation milk yield on productive herd life, longevity and life time calf production in Kankrej cow at organised farm

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Abstract
At an organised farm, the present study explored the effect of first lactation milk yield on productive herd life, longevity, and lifetime calf production in Kankrej cattle. The data on history sheets of Kankrej cattle spread over a period of 15 years (2001-2015) were collected from Livestock Research Station, Sardarkrushinagar, Dantiwada Agricultural University, Sardarkrushinagar, Gujarat situated in semi-arid region of Banaskantha District of North Gujarat region having latitude of 24.35º North and longitude of 72.59º East. 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. Significant effect of first lactation milk yield was observed on 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: First lactation milk yield, herd life, longevity, Kankrej, calf production

Introduction
Worldwide dairy farmers seek for cows that will endure a long time, be productive, and be trouble-free in order to increase farm profits. Productive Herd Life is a health attribute that assesses a cow's genetic propensity to remain in the herd, considers a variety of traits that make a cow more lucrative and sustainable. Herd life, calf output, and their survival for improved replacement are all related to a cow's genetic contribution to the next generation in the form of live offspring. Greater selection intensity results from longer herd life since it enhances total lifetime calf and milk output. Therefore, it is crucial to understand how long an adult female may remain in the herd while still giving birth to calves. The current investigation was conducted with an eye toward the significance of herd life and calf production.

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) Life time 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

To evaluate the effect of first lactation milk yield, the data were classified into seven groups on the basis of first lactation 305 days milk yield as follows:
L1: Less than 1001 kg
L2: 1001 to 1400 kg
L3: 1401 to 1800 kg
L4: 1801 to 2200 kg
L5: 2201 to 2600 kg
L6: 2601 to 3000 kg
L7: Above 3000 kg

In order to examine the effect of the above-mentioned factor on productive herd life, longevity, and lifetime calf production in Kankrej cattle, least squares analysis was used in conjunction with the Harvey statistical model (1990) (6).

Results and Discussion
The least squares means and their standard error were estimated for different first lactation milk yield groups for each trait. The results of present study have been presented in Table 1 and discussed objective wise.

(a) Effect of first lactation milk yield on productive herd life
The statistical analysis of the data indicated that the first lactation milk yield had significant effect on productive herd life of Kankrej cattle. The main reason for this is that animals with low milk production had been culled as a policy matter.
The result of present study is in close agreement with the finding of Hibner and Krzywda (1981) [7] in Poland Black and White Lowland cattle, El-Barbary (1983a) [4] in Egyptian native cow, Durocq *et al.* (1988) [3] in dairy cows, Sahota and Gill (1990) [20] in Sahiwal, Rogers *et al.* (1991) [17] in Jersey, Rizzi *et al.* (1993) [16] in Italian Friesian, Mahdy (1994b) [13] in Holstein Friesian, Ruize *et al.* (1994) [21] in Holstein Friesian, Atrey *et al.* (2005) [2] in Frieswal, Ram and Goswami (2005) [15] in Tharparkar, Kumar (2007) [9] in Hariana, Abbas and Sachdeva (2008) [1] in Sahiwal, Kumar *et al.* (2009) [11] in Hariana, Goshu *et al.* (2014) [5] in Holstein Friesian, Upadhyay *et al.* (2015) [19] in Sahiwal.
On the other hand, non-significant effect of first lactation milk yield on productive herd life was reported by Mahdy (1994a) [12] in Egyptian buffaloes.

(b) Effect of first lactation milk yield on Longevity
In the present study a significant effect of first lactation milk yield on longevity of Kankrej cow was observed. The results indicated that cows with higher first lactation milk yields had longer productive life and higher cumulative milk yield than cows with lower first lactation milk yields. Similar results were reported by Ibeawuchi (1993) [8] in Wadara (Shuwa), Mahdy (1994b) [13] in Holstein Friesian, Atrey *et al.* (2005) [2] in Frieswal, Ram and Goswami (2005) [15] in Tharparkar, Kumar (2007) [9] in Hariana, Abbas and Sachdeva (2008) [1] in Sahiwal, Kumar *et al.* (2009) [11] in Hariana, Goshu *et al.* (2014) [5] in Holstein Friesian, Upadhyay *et al.* (2015) [19] in Sahiwal.
On the other hand, non significant effect of age at first calving on longevity was reported by Mahdy (1994a) [12] in Egyptian buffalo.
The main cause of lower milk production in the first lactation was the culling of cows from the herd. It was therefore concluded that higher milk production in the first lactation was associated with more longevity.

(c) Life time calf production traits
(i) Effect of first lactation milk yield on number of calves born per cow
In the present study a significant effect of first lactation milk yield on number of calves born per cow of Kankrej cow was observed. Similar results were reported by Mukherjee and Tomar (1996) [14], Kumar (1997) [22] in crossbred, Atrey *et al.* (2005) [2] in Frieswal, Ram and Goswami (2005) [15] in Tharparkar, Abbas and Sachdeva (2008) [1] in Sahiwal, Kumar *et al.* (2009) [11] in Hariana, Goshu *et al.* (2014) [5] in Holstein Friesian, Kumar *et al.* (2014) [10] in Frieswal.
On the other hand, non significant effect of first lactation milk yield on number of calves born per cow was reported by Mahdy (1994a) [12] in Egyptian buffaloes.
An increasing trend was noticed for number of calves born with the increase in first lactation milk yield. It was found that higher milk producing cows had more number of number of calves as compared to low milk producers.

(ii) Effect of first lactation milk yield on number of female calves born per cow
In the present investigation a significant effect of first lactation milk yield on number of female calves born per cow of Kankrej cow was observed. Similar results were observed by Mukherjee and Tomar (1996) [14] in Brown Swiss cross, Kumar (1997) [22] in crossbred, Ram and Goswami (2005) [15] in Tharparkar, Atrey *et al.* (2005) in Frieswal, Abbas and Sachdeva (2008) [1] in Sahiwal, Kumar *et al.* (2009) [11] in Hariana, Goshu *et al.* (2014) [5] in Holstein Friesian.
Despite the increase in the first lactation milk yield, there was an increase in the number of female calves born with an increase in the number of female calves. According to the result, there were more female calves born to higher milk producing cows than to low milk producing cows in comparison to low milk producing cows.

(iii) Effect of first lactation milk yield on umber of female calves reaching milking herd per cow
In the present study a significant effect of first lactation milk yield on number of female calves reaching milking herd per cow of Kankrej cow was observed. Similar result was reported by Mukherjee and Tomar (1996) [14] in Brown Swiss cross, Kumar (1997) [22] in crossbred cattle, Atrey *et al.* (2005) [2] in Frieswal, Ram and Goswami (2005) [15] in Tharparkar, Abbas and Sachdeva (2008) [1] in Sahiwal, Kumar *et al.* (2009) [11] in Hariana.
On the other hand, non significant effect of first lactation milk yield on number of female calves reaching milking herd per cow was reported by Goshu *et al.* (2014) [5] in Holstein Friesian.
The main reason for higher replacement with higher milk production in the first lactation that female calves of those cows with high milk production have been included in the herd as a selection.

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

First lactation milk yield	n	Mean±S.E.				
		PH	L	NC	NFC	NFRMH
L_1	38	443.24d±164.25	1679.50d±164.93	1.39c±0.36	0.76b±0.24	0.44a±0.20
L_2	34	721.15cd±175.12	1965.62cd±175.85	1.99bc±0.39	1.06b±0.26	0.65a±0.21
L_3	66	1290.97bc±132.11	2536.62bc±132.66	3.17b±0.29	1.50ab±0.19	0.94ab±0.16
L_4	75	1634.06ab±134.60	2873.75a±135.15	3.88ab±0.30	1.97ab±0.20	1.53c±0.17
L_5	27	2029.80a±202.33	3280.93ab±203.17	4.52a±0.45	2.19a±0.53	1.80c±0.25
L_6	7	1344.18abc±356.63	2582.53abc±358.11	3.09abc±0.80	1.25ab±0.70	1.15b±0.44
L_7	4	2000.51ab±470.69	3228.91ab±472.64	4.40ab±1.06	2.20ab±1.06	1.13b±0.59

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.

Conclusion

It is recommended that Kankrej cattle with a first lactation milk yield ranging from 2201-2600 kg be selected for higher productive herd life and longevity in the herd, as well as for higher lifetime calf production.

Genetic and non-genetic factors influencing disposal of animals can also assist in developing management and breeding strategies to reduce disposal.

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