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EFFECT OF BREEDING *Bos indicus* WITH *Bos taurus* ON AGE AT FIRST CALVING IN PAKISTANI ADMINISTRATIVE KASHMIR

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The objective of this study was to reduce the age at first calving of *Bos indicus* by crossing with *Bos taurus* in Pakistani administrative areas of Kashmir. A total of 48 indigenous cows, 32 Indigenous x Jersey (F1), 19 Indigenous x Jersey (F2) and 18 Indigenous x Jersey × Friesian cows were used to compare their age at first calving. The lowest mean age at first calving was observed in F_1 and F_2 hybrid cows where it was 951.2±37.35 and 1086 ±37.89 days respectively, followed by F_1 × Friesian (1086 ±37.89) while the highest mean age at first calving was observed in nondescript indigenous (*Bos taurus*) cows (1861 ± 42.45 days). Analysis of variance showed that the mean age at first calving decreased highly significantly in F_1 ($P < 0.05$); F_2 ($P < 0.05$) and F_1 × Friesian ($P < 0.05$) cows compared to that of nondescript indigenous cows. Mean age at first calving of F_1 hybrid cows did not differ significantly ($P > 0.05$) compared to F_2 and F_1 × Friesian cows. Similarly, the mean AFC of F_2 and F_1 × Friesian did not differ significantly ($P > 0.05$) from each other. No sire effect was found on age at first calving within F_2 and cross bred ($P > 0.05$). In future crossing of *Bos indicus* with *Bos taurus* should be continue for the up gradation of indigenous cows and maximum of 50% exotic genes should allow to be incorporated in the female stock.
Keywords: *Bos indicus*, crossbreeding, grading up, indigenous cows, sub-tropical.

INTRODUCTION

In Azad Jammu and Kashmir (AJK) the majority of the rural population depends on forestry, livestock and agriculture to eke-out its subsistence. Low agriculture productivity has very adversely affected the traditional lifestyle and average per capita income of the rural household. The productivity of dairy cattle in AJK is very low, this may be attributed to poor genetic makeup of indigenous cattle (Khan *et al*., 2014). The indigenous cattle of AJK are small sized with live weight ranges from 175 to 225 kg (Tanner, 1978). Reproductive performance of breeding cow is one of the most important factor that is a prerequisite for sustainable dairy production system and influencing the productivity (Alemayehu and Moges, 2014). Age at first calving (AFC) is one of the most important reproductive trait. The AFC of indigenous cattle of AJK is very high compared with European dairy breed. AFC is one of the important factors that contributes in economic return and a reduction in AFC will minimize the raising cost, shorten the generation interval, and subsequently increase the number of lactation per animal (Zewdu *et al*., 2015). the Cow's productive life starts with first calving. An early AFC decreases the generation interval. Early age at first calving results in more calves and milk during the life time of a cow. Therefore, AFC is one of the most important economic traits of dairy cattle. Age at first calving has an important bearing on early economic return on total lifelong production (Mourad, 1997). As generally indicative to a better management index at farm level average age of first calving should be optimally around 2 years (Wiltbank, 1970). To improve the productivity of indigenous cattle a crossbreeding program was started in 1990 for the very first time in AJK. The present research was conducted to improve the productivity by increasing the milk production and reducing the AFC of of indigenous *Bos indicus* cattle by crossing with *Bos taurus* such as Jersey and Friesian and to access the adaptability of crossbred cattle in sub-tropical highland type environment of AJK.

MATERIALS AND METHODS

***Animals and farm*:** Livestock Development Research Centre (LDRC) is located at the bank of river Jhelum 6 kilometres away from the main city of Muzaffarabad which is the capital of AJK. This farm was established 1940 by the Government of Azad Jammu and Kashmir by purchasing of indigenous cattle. The cows have been kept in farms the roof constructed from asbestos sheet and iron bar, the floor is of concrete.

***Breeding scheme*:** In 1990 a crossbreeding program was started. In first type of crosses F1 (Indigenous × Jersey) offspring were produced. F1 offspring's calving occurred from July, 1991 to April, 1998. In second type of cross F1

offspring were crossed among them self, as a result of which F1 × F1 (F2) offspring were produced during the period of May, 1994 to April, 1999. In third type of cross the three breed crossbred cows (25 % indigenous + 25 % Jersey + 50 % Friesian) were developed by crossing F1 female with pure Friesian bull during May 1994 to April 1999.

***Feeding regime*:** Cows were fed on forage (elephant grass and maize, green berseem and oats) roughages comprised of wheat straw and stoves of maize. The concentrate mixture (composed of wheat bran, rape seed cake and cotton seed cake and molasses). Lumps of common salts (sodium chloride) were placed in manger and cows were free to lick.

***Data collection*:** It is a retrospective study, carried out over a period from 1990–2010. The data regarding productive and reproductive records of 84 cows out of which 37 were indigenous, 25 were F_1 (Indigenous × Jersey), 8 were $F_1 \times F_1$ (F_2) and 14 were F_1 × Friesian cows.

***Age at first calving*:** Age at first calving of cows was calculated by the interval between the date of birth and the date of calving of a heifer following pregnancy of full term.

***Statistical analysis*:** The difference in the mean AFC among the four breed groups were worked out through analysis of variance. Graph Pad Prism 5 package was used for statistical analysis. Difference was significant when $P < 0.05$.

RESULTS AND DISCUSSION

Mean age at first calving of indigenous and crossbred dairy cows is given in Table 1. Mean age at first calving was highest in nondescript indigenous cows (1861 ± 42.45 days) followed by F_1 × Friesian (1086 ±37.89) while lowest was found in F_1 and F_2 hybrid cows where it was 951.2±37.35 and 1086 ±37.89 days respectively. Analysis of variance showed that the mean age at first calving decreased highly significantly in F_1 ($P < 0.05$); F_2 ($P < 0.05$) and F_1 × Friesian ($P < 0.05$) cows compared to that of nondescript indigenous cows. Mean age at first calving of F_1 hybrid cows did not differ significantly ($P > 0.05$) compared to F_2 and F_1 × Friesian cows. Similarly, the mean AFC of F_2 and F_1 × Friesian did not differ significantly ($P > 0.05$) from each other.

No sire effect was found on age at first calving within F_2 crossbred. Analysis of variance indicated that there were no variations of age at first calving among daughters of sire 1 sire 2 and sire 3 and the differences did not differ significantly ($P < 0.05$). Similar to F_1 crossbred cows age at first calving was not affected by sire within F_1 × Friesian crossbred cows $t_{(15)} = 0.3025$; $P > 0.05$).

Present study revealed that the mean AFC of indigenous cows (1861 ± 42.45 days) was higher than the mean AFC of local cows from some Asian countries such as in Deshi cattle (47 ± 7 months) of India (Moulick *et al*., 1972); Deshi cattle (1365 ± 6.20) of West Bengal (Sarkar *et al*., 2007); Gray cattle (1191 ± 19.7 days) of North Bengal (Al-Amin *et al*., 2007) and indigenous cow of (40.48 ± 4.54 months) Bangladesh (Rokonuzzaman *et al*., 2009). Mean AFC of indigenous cow in this study was also higher than the mean AFC of cows from African countries such as local cattle of Northern Ethiopia has an AFC of 3.41 ± 0.70 years (Weldeslasse *et al*., 2012).

The AFC of Jersey cows in different countries was found to be 888.53 ± 15.97 days in Pakistan (Lateef *et al*., 2008); 946 days in Russia (Denisava, 1981); 956.24 ± 35.82 days in India (Matoch and Tomar, 1983) and 945.93 days in Nigeria (Adeneye, 1985). As a result of crossbreeding of indigenous cows with Jersey in this study the mean AFC in indigenous cows decreased significantly in crossbred cows. The lowest mean AFC was observed in F_1 crossbred cows (951.2 ± 37.35 days) and it was comparable to that of Jersey cows (926.48 ± 10.29 days) studied by (Sattar *et al*., 2004); lower than the mean AFC of imported Jersey cows (1010.73 ± 21.84 days) (Suhail *et al*., 2010) but higher than the mean AFC of farm born Jersey cows (888.53 ± 15.97) observed by Lateef *et al*. (2008) under subtropical conditions of Pakistan. Mean AFC of F_1 crossbred cows in present study was lower than the findings of (Zaman *et al*., 1983) for F_1 (Jersey × Sahiwal) cows (793.7 ± 10.76 days) at Livestock Experiment Station Bahadurnagar, Pakistan and F_1 (Jersey × Dehsi) cows (1002.3

Table 1. Comparative AFC of indigenous and crossbred dairy cows developed at Livestock Development Research Centre (LDRC) Muzaffarabad, Azad Kashmir.

Breed Groups		Age at First Calving	Range
Indigenous		1861±42.45 (48)	1080 – 2543
Indigenous × Jersey (F_1)		951.2±37.35^{a***} (32)	712 – 1249
$F_1 \times F_1$ (F_2)	Sire 1	1024±69.38 (9)	736 – 1383
	Sire 2	1130±26.58 (8)	1073 – 1277
	Sire 3	1192±126 (2)	1066 – 1318
	Overall	1086 ±37.89^{a***} (19)	736 – 1383
F_1 × Friesian	Sire 1	965.2 ± 38.39 (11)	789 – 1137
	Sire 2	946.2 ± 47.61 (6)	798 – 1108
	Overall	952.1±28.23^{a***}(18)	789 – 1137

a = Indigenous vs F_1, F_2 & F_1 × Friesian; b = F_1 vs F_2 and F_1 × Friesian c = F_2 vs F_1 × Friesian, * shows $P \leq 0.05$, ** shows $P \leq 0.01$, *** shows $P \leq 0.001$; Values in () = Number of cows

± 49.4 days) in Bangladesh Agriculture University (Nahar *et al*., 1992).

As a result of selfing of F_1 offspring mean AFC increased in F_2. This increase may be due to segregation of genetics factors. However, when F_1 crossbred cows were crossed with Friesian bull then in F_1 × Friesian cows the mean AFC became almost equal to that of F_1 crossbred cows.

Mean AFC of Holstein Friesian cows was 944.08 ± 12.71 days in Pakistan (Younas *et al*., 2008); 927.81 ± 115.6 days in Chile, 924.64 ± 15.21 days in Ghana (Perez *et al*., 1985) and 888.14 in USA (Gyawn *et al*., 1988). Mean AFC in F_1 × Friesian cows in present study was comparable as indicated in farm born Holstein Friesian cows in Punjab (952.90 ± 15.14 days) (Lateef *et al*., 2008); Holstein Friesian cows (987.87 ± 9.81 days) in Pakistan (Sattar *et al*., 2004). Rokonuzzaman *et al*. (2009) recorded a mean AFC in Indigenous × Friesian cow (34.12 ± 3.78 months) in Bangladesh is also comparable to the findings of AFC in F_1 × Friesian cows in this study.

Mean AFC in F_1 (Holstein Friesian × Dehsi) cows (1201.4 ± 29.6 days) at Bangladesh Agriculture University (Nahar *et al*., 1992) was higher than mean AFC in F_1 × Friesian cows in present study but it was lower in Friesian × Non-Descript cows (888.0 ± 21.47 days) in Pakistan (Zaman *et al*., 1983).

***Conclusion*:** The present study suggests that age at first calving can be reduced in indigenous cattle of Azad Jammu and Kashmir by crossing with exotic breed of Jersey and Friesian.

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