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Production and Reproduction Performance of Sahiwal and HF × Sahiwal Cows

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ABSTRACT

Background: Milk production is one of the most important economic traits in dairy cattle. Crossing of zebu cattle (*Bos indicus*) with temperate cattle breeds (*Bos taurus*) was undertaken to improve the milk production in India. Crossbreeding has resulted in improved production performance of the dairy animlas over the past few decades.

Methods: Data on 50 purebred Sahiwal cows from the Livestock Farm Complex, College of Veterinary Science, Rajendranagar, Hyderabad and 50 Holstein Friesian × Sahiwal crossbred cows maintained at the Military Dairy Farm, Secunderabad were utilized to study the influence of breed and parity on various production and reproduction traits. The various traits studied were: Total lactation milk yield (TLMY) Lactation length (LL), Peak yield (PY), Age at first service (AFS), Age at first calving (AFC), Gestation period (GP), Service period (SP), Dry period (DP) and Calving interval (CI).

Result: In the present study, significant effect of breed was found on the TLMY and PY with the crossbreds recording higher values for both the traits. The means for TLMY, PY, LL, GP, SP, DP and CI were 1768.32±109.67 kg, 10.17±0.50 kg, 304.41±13.00 days, 277.71±2.24 days, 182.60±15.51 days, 167.47±10.68 days and 430.23±13.46 days in Sahiwal and 2983.45±78.32 kg, 14.92±0.36 kg, 324.71±9.29 days, 275.34 days, 181.09±10.91 days, 127.01±7.51, 413.61±9.47 days in crossbred cows respectively. It may be concluded that the productive performance of crossbred cows was better than that of indigenous cows.

Key words: Crossbred cows, Production, Reproduction traits, Sahiwal.

INTRODUCTION

Crossbreeding of non-descript cattle with exotic cattle breeds is being practiced as it is the fastest way of increasing milk production of the indigenous low producing cattle. With the several initiatives undertaken by the Government of India for augmenting milk production by crossbreeding, tremendous progress has been achieved so far. As per the Economic survey 2019-20, India stands at the number one position in the World in milk production and the per capita availability of milk increased from 130 g/day in the year 1950-51 to 394 g/day in the year 2018-19 (NDDB, 2020). Holstein Friesian, the world-renowned breed of cattle known for its high milk production is extensively used for crossbreeding in India for more than 100 years. Several crossbred populations with the Friesian inheritance ranging from 35.93% to 93.75% are being maintained at different farms in the country. The increased performance of the crossbreds is due to the superiority of the exotic cattle and hybrid vigour. The present investigation was carried out to study the production and reproduction performance of the Sahiwal and crossbreds (HF × Sahiwal) cows.

MATERIALS AND METHODS

Data on 50 purebred Sahiwal cows from the Livestock Farm Complex, College of Veterinary Science, Rajendranagar, Hyderabad and 50 crossbred cows (Holstein Friesian × Sahiwal crosses) maintained at the Military dairy farm, Secunderabad were utilized to study the influence of breed and parity on various production and reproduction traits. Both the farms are located in the same geographical location and so experience similar weather conditions. Both Sahiwal and crossbred herds were provided with standard housing. The animals were given balanced ration comprising of both green and dry fodder. Adequate quantities of concentrates, based on their maintenance and production requirements were given to the milch animals. Regular deworming and vaccination schedules were followed in both the herds. The Sahiwal farm was established in the year 2015 with the main

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objective of conservation and propagation, while the military dairy farm, Secunderabad was one of several such breeding farms established by the Government of India indifferent agro-climatic conditions, with a primary objective to supply the milk to the defense forces. In both the farms, selective breeding for higher lactation milk yield was employed. The various production and reproduction traits studied were Total lactation milk yield (TLMY) Lactation length (LL), Peak yield (PY), Age at first service (AFS), Age at first calving (AFC), Gestation period (GP), Service period (SP), Dry period (DP) and Calving interval (CI).

Statistical analysis was done using SPSS software, Version 25. Two way analysis of variance was employed to study the effect of genetic group and parity on various production and reproduction traits using the following mathematical model.

$$Y_{ijk} = \mu + G_i + P_j + e_{ijk}$$

Where,

Y_{ijk} = record on n^{th} cow belonging to j^{th} parity under i^{th} genetic group.

μ = Overall mean.

G_i = Effect of the i^{th} genetic group (i = 1 and 2 for Sahiwal and crossbreds, respectively).

P_j = Effect of j^{th} parity (j = 1 to 4 in Sahiwal and 1to 6 in crossbreds).

e_{ijk} = random error assumed to be distributed normally and independently with mean zero and variance σ^2_e.

Significant differences between the means of different breeds and parities were tested by Duncan's Multiple Range Test (DMRT). Values were considered significant at P≤0.05 and presented as means ± standard errors.

RESULTS AND DISCUSSION

The means of various production and reproduction traits of Sahiwal and HF × Sahiwal cows are presented in Table 1.

Production traits

The present investigation revealed that the total lactation milk yield was significantly (P≤0.01) affected by breeds with the crossbred cows recording the higher total lactation milk yield (2983.45 ± 78.32 kg) and peak yield (14.92 ± 0.36 kg) as compared to Sahiwal cows. Many authors have reported that crossbred cows have higher total lactation milk yield than the indigenous cows (Dubey and Singh, 2005; Reddy *et al*.,2015 and Chakravarthi *et al.*, 2017).

The mean total lactation milk yield in Sahiwal (1768.32 kg) was in agreement with the means reported by Kumar and Gandhi (2011) and Reddy *et al.* (2015). However, Javed *et al.* (2000), Joshi *et al.* (2001), Maurya and Saraswat (2002) and Verma *et al.* (2016), reported higher means, while Rehman and Khan (2012) and Chakravarthi *et al.* (2017) observed means lower than those obtained in the present investigation. The mean total lactation milk yield in crossbred cows (2983.45 kg) obtained in the present study was almost similar to the means reported by Lakshmi *et al.* (2010). However, Kumar *et al.* (2017), Kundu *et al.* (2018) and

Table 1: Means for various production and reproduction traits.

Effect	n	TLMY (kg)		PY (kg)		LL (days)		GP (days)		n	SP (days)		DP (days)		CI (days)	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE		Mean	SE	Mean	SE	Mean	SE
Overall	305	2375.88	83.92	12.54	0.38	314.56	9.95	276.52	1.72	295	181.84	11.77	147.24	8.11	421.92	10.22
Genetic group																
Sahiwal	121	1768.32^{b}	109.67	10.17^{b}	0.50	304.41	13.00	277.71	2.24	115	182.60	15.51	167.47^{a}	10.68	430.23	13.46
Crossbreds	184	2983.45^{a}	78.32	14.92^{a}	0.36	324.71	9.29	275.34	1.60	180	181.09	10.91	127.01^{b}	7.51	413.61	9.47
Parity																
1	100	2215.50^{c}	74.53	11.45^{c}	0.34	322.66	8.84	276.81	1.53	100	202.61	10.36	156.40	7.13	434.62	8.99
2	82	2365.50^{b}	81.49	12.75^{b}	0.37	294.67	9.66	273.69	1.67	80	176.84	11.33	138.96	7.80	428.72	9.83
3	64	2681.42^{a}	91.01	13.64^{a}	0.42	304.57	10.79	279.28	1.86	62	167.15	13.19	134.67	9.08	429.44	11.45
4	34	2644.33^{a}	120.92	13.49^{a}	0.55	302.91	14.34	278.19	2.47	32	163.24	17.57	133.21	12.10	418.86	15.25
5	17	2623.23^{a}	155.75	13.66^{a}	0.71	320.25	18.47	272.86	3.19	15	180.50	22.10	152.27	15.22	432.02	19.18
6	8	2407.78^{b}	186.32	13.62^{a}	0.85	315.15	22.09	280.54	3.81	6	183.32	26.68	148.86	18.37	419.50	23.15

Means with similar superscripts do not differ significantly (P≤0.05).

Annual Report CIRC, (2019) observed means higher than those obtained in the present investigation. Varying lactation lengths, in addition to the geographical location and the different managemental practices, followed in the respective farms might be the reasons for the differences in the total lactation milk yields.

The mean peak yield in Sahiwal cows in the present investigation was 10.17 kg which was higher than the mean peak yield reported by Sharma *et al.* (2010), Reddy *et al.* (2015) and Chakravarthi *et al.* (2017). The mean (14.92 kg) peak yield in crossbred cows obtained in the present study was in accordance with that reported by Lakshmi *et al.* (2010), Kumar *et al.* (2017) and Annual Report CIRC, (2019) in Holstein Friesian × Sahiwal cows.

Though the effect of the breed was found to be non-significant on the lactation, the mean lactation length in crossbred cows was found to be higher (324.71 days) than in Sahiwal cows (304.41 days). The results obtained were within the wide range (235 to 348.25 days) as observed from published literature on Sahiwal and HF crossbred cows (Rehman and Khan, 2012 and Reddy *et al.*, 2015). The crossbreds, in the present investigation, recorded higher peak yield (4.75 kg more than Sahiwal), lactation length (20.3 days longer than Sahiwal) and consequently, the elevated TLMY (1215.13 kg higher than Sahiwal).

The analysis revealed significant (P<0.01) influence of parity on total lactation milk yield with the mean increasing from first to third parity, followed by an irregular trend in the later parities. The highest and lowest total lactation milk yields were recorded for the cows in parities three (2681.42kg) and first (2215.50kg), respectively. A perusal of the published literature also revealed a significant effect of parity on total lactation milk yield in Sahiwal cows (Kumar and Gandhi, 2011, Rehman and Khan, 2012 and Singh *et al*., 2016) and in HF crosses (Lakshmi *et al*., 2010, Kakati *et al*., 2017 and Kundu *et al*., 2018). The consistent increase in total lactation milk yield up to the third lactation might be due to the development occurring in the body, particularly in the mammary glands due to pregnancy and lactation. The irregular trend observed beyond the fourth lactation in the present study could be attributed to the small sample size and also due to the variations in climatic and environmental factors to which the cows were exposed during different parities.

Reproduction traits

The overall mean gestation period, service period, dry period and calving interval obtained in the present study were 276.52 ± 1.72, 181.84 ± 11.77, 147.24 ± 8.11 and 421.92 ± 10.22 days respectively. The dry period was significantly (P<0.01) affected by breed, while parity had a non-significant effect on the gestation period, service period, dry period and calving interval.

The mean gestation period in Sahiwal was 277.71 days which was lower than the mean obtained by Reddy *et al*. (2015), while the mean gestation period in crossbred cows was 275.34 days which was similar to the mean reported by Lakshmi (2007) in HF × Sahiwal cows of the military dairy farm, Secunderabad. Parity was found to be non-significant on the gestation period. Lakshmi (2007) also found a non-significant effect of parity on the gestation period.

The mean service period was 182.60 and 181.09 days in Sahiwal and crossbred cows respectively. Published literature revealed that the service period ranged from 123.73 to 205 days in Sahiwal cows (Naskar *et al.*, 2005 and Reddy *et al*., 2015) and from 148.24 to 183.28 days in HF × Sahiwal cows (Lakshmi, 2007 and Kumar *et al.*, 2015). Parity was found to be non-significant on the service period in the present study probably because of the small sample size. However, Lakshmi, (2007) reported a significant effect of parity on the service period with the lowest and highest means obtained for cows in parities 12 and 1, respectively which was due to differences in the environmental and managemental practices over different parities.

The mean dry period in Sahiwal cows was 167.47 days which was within the wide range (133.58 to 176.79 days) as observed from the published literature on Sahiwal cows (Naskar *et al*., 2005 and Reddy *et al*., 2015). The mean dry period of 127.01 days obtained in the present study corroborated with the findings of Lakshmi (2007) in HF × Sahiwal cows. However, lower means were obtained by Singh *et al*. (2014) and Kumar *et al.* (2015) in crossbred cows. In the present investigation, parity was found to be non-significant on the dry period but significant effect of parity was observed by Lakshmi (2007) and Singh *et al*. (2014) in HF × Sahiwal cows.

The mean calving interval in Sahiwal was 430.23 days which was more than the mean obtained by Naskar *et al.* (2005), while the mean calving interval in crossbred cows was 413.61 days which was less than the mean reported by Lakshmi (2007), Singh *et al*. (2014), Kumar *et al.* (2015), Kakati *et al.* (2017) and Annual report, CIRC, (2019) in HF × Sahiwal cows. Parity was found to be non-significant on the calving interval while Lakshmi (2007) and Kakati *et al.* (2017) reported a significant effect of parity on calving interval, which was attributed to the variations in the age of the cows and also the various climatic factors faced by the cows in different parities.

The mean age at first service and age at first calving were 641.34 ± 17.24 and 947.26 ± 19.67 days, respectively in crossbred cows, while these means could not be estimated in Sahiwal cows due to paucity of records. Lakshmi (2007) also reported similar means for AFS and Kundu *et al.* (2018) for AFC in HF × Sahiwal cows.

CONCLUSION

In the present investigation, the effect of breed was found to be significant on total lactation milk yield and peak yield, which are important traits of economic importance in dairy cows. The crossbreds recorded higher Total lactation milk yield (TLMY) and Peak yield (PY). It was also found that the

crossbreds had lower service periods, dry periods and calving intervals than the indigenous Sahiwal cows.

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