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Productive and reproductive performance of dairy animals in Udaipur district of Rajasthan

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Abstract

A study on productive and reproductive performance of dairy animals was conducted in Non-Tribal and Tribal area of Udaipur district with 160 dairy farmers. In the Non-Tribal area, dairy cattle had higher mean values for lactation length (268.87 days), total lactation milk yield (2089.64 litres), average milk yield per day (7.79 litres), peak yield (8.17 litres) and average milk SNF (8.64%) compared to the Tribal area. Similarly, dairy buffaloes in the Non-Tribal area had higher mean values for lactation length (280.17 days), total lactation milk yield (1886.64 litres), average milk yield per day (6.72 litres), peak yield (7.39 litres) and average milk SNF (8.91%) compared to the Tribal area. In the Tribal area, both dairy cattle and buffaloes exhibited higher mean values for age at first calving at 1372.34 days for cattle and 1624.88 days for buffaloes, service period was 145.74 days for cattle and 168.24 days for buffaloes, calving interval was 461.24 days for cattle and 478.06 days for buffaloes, dry period was 159.08 days for cattle and 183.31 days for buffaloes, and post-partum oestrus was 107.64 days for cattle and 125.71 days for buffaloes compared to the Non-Tribal area. The conception rate and heat period were significantly ($p < 0.01$) lower in both dairy cattle and buffaloes in the Tribal area compared to the Non-Tribal area.

Keywords: Solid not fat, significance at 1% level, fat percentage, tribal, non-tribal

Introduction

Dairy farming plays a pivotal role in the economy of our country. It helps in augmenting food supply, generating employment and raising nutritional level. Indian dairy represents one of the largest and fastest growing sectors. Dairy enterprise is a solution to many problems of agricultural, besides being an effective tool to improve socio-economic condition of rural income to farmer. Total milk production in the country during 2021-22 was 221.06 million tonnes. In the year 2021-22, the milk production has registered an annual growth rate of 5.29%. Top five milk producing States are Rajasthan (15.05%), Uttar Pradesh (14.93%), Madhya Pradesh (8.06%), Gujarat (7.56%) and Andhra Pradesh (6.97%). The per-capita availability of milk is 444 gram/day during 2021-22, which was increased by 17 gram/day over previous year. In 2020-21, the share of Livestock at constant prices in Agriculture Sector and total GVA was 30.13% and 4.9% respectively (Animal Husbandry Statistics -2023, GOI). As per the figures of 20th livestock census, India has over 535.78 million total livestock population in 2019 and out of which cattle population of India is 192.49 million which contribute, around 35.94 percent of the livestock population. The buffalo population of India is 109.85 million which accounts for 20.45 percent of livestock population. Among the livestock products, milk consists of the highest share, and it accounted for 67.20 percent of the livestock sector in 2017. In Rajasthan, Tribal population is 12% of the state population. The cattle, buffaloes and goat are Non-descript type and their up keep is far from the scientific lines. The daily production is hardly 1-2 liters/animal, as the animals are genetically poor and receive nutritionally poor feed quantitatively and qualitatively and largely dependent upon grazing in hilly terrain. The main handicaps in the promotion of dairy husbandry in these areas are the adverse climatic condition, poor grazing, poor management and inadequate marketing facilities, poor genetically potential and acute shortage of feed and fodder are the fundamental constraints faced by the Tribal and Non-Tribal peoples. In addition to this lack of knowledge of modern management practices appear to be also one of the factors for slower growth of this sector. Very scanty reports on productive and reproductive performance of cow and buffalo are available in Tribal and Non-Tribal area. Hence there was need to study of some economic traits of dairy cattle and buffalo under Tribal and Non-Tribal areas of Udaipur district.

Materials and Methods

The study was conducted in the Udaipur district of Rajasthan. Four tehsils of the district were under study, in which two tehsils were selected from Tribal group namely Kotra and Jhadol, while other two were from Non-Tribal group namely Mavli and Vallabhnagar. The tehsils were selected on the basis of highest dairy animals population. Four villages were selected from each tehsil and from each village 10 respondents who possess minimum five dairy animals were selected randomly. The data was collected from 160 dairy farmers with the help of a well- structured pre-tested interview schedule by personal interview. The collected data were analyzed by using simple statistical methods like mean, standard deviation and Two sample Z-test as follows:

Mean

Mean is nothing but the average of the given set of values. It denotes the equal distribution of values for a given data set.

$$\text{Mean} = \frac{\text{Sum of productive or reproductive economic trait of animals individually}}{\text{Total no. of dairy animals in given tehsil}}$$

Standard deviation

Mean and standard deviation were used for categorizing the dairy animals into different categories viz. lactation length, Average milk yield, service period etc. and to find out the variability of the dependent and independent variable involved in the study.

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

S = Standard deviation, n = Sample size (No. of animals)

$\sum Xi$ = Sum of total scores in sample

$\sum Xi^2$ = Sum of squares of score of each dairy animal in sample

Two sample ‘Z’ test (Standard Normal Deviate test)

This test was used to observe significance of difference between two sample mean for large sample (i.e. n>30).

Formula for ‘Z’ test is as under:

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Where,

- x_1, x_2 : sample means
- σ_1, σ_2 : population standard deviations
- n_1, n_2 : sample sizes

Results and Discussion

This section of the chapter deals with comparison of Tribal and Non-Tribal dairy farmers for their productive and reproductive performance of their dairy animals. The breeds of Cattle in Tribal area were sanchori, cross-breeds and Non-descript types and of buffaloes were mostly surti and murrh whereas in Non-Tribal area in cattle mostly Cross- breeds and in buffaloes mostly surti and mehsana breeds were there. Hence data of the dairy animals were recorded based on the best performance among the herds in context to their economic traits.

Productive and reproductive performance of dairy animals

Productive performance of dairy animals

Results pertaining to productive performance of dairy cattle and buffalos are presented separately in subsequent sub heads.

Productive performance of dairy cattle

In relation to the production performance of dairy cattle in Tribal and Non-Tribal area of Udaipur district, it was felt necessary to study the difference between Non-Tribal and Tribal area dairy farmers. To find out the difference in the production performance of the dairy cattle in Non-Tribal and Tribal area, ‘Z’ test was applied.

Table 1: Productive performance of dairy cattle in Non-Tribal and Tribal area

S. No.	Particulars	Cattle				‘Z’ value
		Non-Tribal (n=94)		Tribal (n=72)		
		Mean	S.D.	Mean	S.D.	
1.	Lactation length (days)	268.87	18.84	259.82	5.92	4.38**
2.	Total lactation milk yield (lit.)	2089.64	294.57	1098.94	240.19	23.86**
3.	Average milk yield/day (lit.)	7.79	1.05	4.24	1.15	20.43**
4.	Days to attain peak yield	45.53	6.01	48.95	9.06	2.77**
5.	Peak yield (lit.)	8.17	0.99	5.31	0.75	21.25**
6.	Average milk fat (%)	3.58	0.61	4.46	0.62	9.19**
7.	Average milk SNF (%)	8.64	0.32	8.43	0.13	5.83**

** Significant at 1 percent level of significance n = No. of cattle

Data depicted in Table 1 indicated that calculated ‘Z’ value was found to be greater than its tabulated value at 1 percent level of significance in all the parameter studied. Thus, null hypothesis (NH_{01}) was rejected and alternate hypothesis (RH_1) was accepted, which leads to the conclusion that there was highly significant difference in production performance of dairy cattle between Non-Tribal and Tribal area.

The mean value of lactation length, total lactation milk yield, average milk yield/day, peak yield and average milk SNF in dairy cattle was 268.87 days, 2089.64 litres, 7.79 litres/day, 8.17 litres and 8.64%, respectively in Non-Tribal area. These values in Tribal area were 259.82 days lactation length,

1098.94 litres total lactation milk yield, 4.24 litres/day average milk yield, 5.31 litres peak yield and 8.43% average milk SNF. The values of productive performance viz. lactation length, total lactation milk yield, average milk yield/day, peak yield and average milk SNF were significantly higher in Non-Tribal than Tribal area. But the days to attain peak yield and average milk fat in Tribal area were 48.95 days and 4.46% respectively. In Non-Tribal area it was significantly lower i.e. 45.53 days to attain peak yield and 3.58% average milk fat than Tribal area.

The results of the present study are in conformity with those of Meena *et al.* (2015) [9] who reported data pertaining to

lactation length of cross-bred cow and indigenous cow which were 274±16 and 294±18 days/animal, respectively. Total lactation milk yield of cross-bred cows and indigenous cows were 2091.35±145 and 964.65±98 liter/animals, respectively. Average daily milk yield of cross-bred cows and indigenous cows were as 7.55±0.74 and 3.27±0.3 liter/day/animal, respectively. Similarly, Kale *et al.* (2017) [6] in their study observed that the average peak milk yield of cross-bred and indigenous cows were 8.91±0.60 and 5.25±0.87 (liters/day), respectively in the surveyed area. Murugeppa *et al.* (2020) [10] also found that average days to reach peak yield were

46.19±1.51 days in Malnad Gidda cattle. Prakash *et al.* (2008) [15] also found that the average fat percentage of the milk was estimated to be 3.87±0.33 and the SNF percentage of Gangatiri cows' milk was found as 8.69±0.28.

Productive performance of dairy buffaloes

To find out the difference in the production performance of the dairy buffaloes in Non-Tribal and Tribal area, 'Z' test was applied. The data pertaining to productive performance of dairy buffaloes in Non-Tribal and Tribal area of the present study are presented in Table 2.

Table 2: Productive performance of dairy buffaloes in Non-Tribal and Tribal area

S. No	Particulars	Buffalo				'Z' value
		Non-Tribal (n=103)		Tribal (n=85)		
		Mean	S.D.	Mean	S.D.	
1.	Lactation length (days)	280.17	14.10	264.15	5.84	10.50**
2.	Total lactation milk yield (lit.)	1886.84	481.85	1437.40	169.34	8.83**
3.	Average milk yield/day (lit.)	6.72	1.31	5.43	1.17	7.12**
4.	Days to attain peak yield	51.61	4.61	56.80	8.15	5.22**
5.	Peak yield (lit.)	7.39	0.31	6.44	0.51	14.77**
6.	Average milk fat (%)	6.11	0.64	7.21	0.78	10.49**
7.	Average milk SNF (%)	8.91	0.16	8.51	0.30	10.72**

** Significant at 1 percent level of significance n=No. of buffaloes

Data depicted in Table 2 indicated that calculated 'Z' value was found to be greater than its tabulated value at 1 percent level of significance. Thus, null hypothesis (NH₀) was rejected and alternate hypothesis (RH₁) was accepted, which leads to the conclusion that there was highly significant difference in production performance between Non-Tribal and Tribal area dairy buffaloes.

The mean value of lactation length, total lactation milk yield, average milk yield/day, peak yield and average milk SNF in dairy buffaloes was 280.17 days, 1886.64 litres, 6.72 litres/day, 7.39 litres and 8.91%, respectively in Non-Tribal area. Corresponding values in Tribal area were 264.15 days lactation length, 1437.40 litres total lactation milk yield, 5.43 litres/day average milk yield, 6.44 litres peak yield and 8.51% average milk SNF. The values of productive performance *viz.* lactation length, total lactation milk yield, average milk yield/day, peak yield and average milk SNF were significantly higher in Non-Tribal than Tribal area. But the mean days to attain peak yield and average milk fat in Tribal area were 56.80 days and 7.21% respectively. In Non-Tribal area it was significantly lower i.e. 51.61 days to attain peak yield and 6.11% average milk fat than Tribal area.

The findings are supported by Patel *et al.* (2020) [11] who found that the lactation length of buffaloes was 263.07±34.89 days, lactation milk yield was 2174.36±58.67 liters and the average daily milk yield was 6.62±0.84 liters/day/animal in Haryana State. Similarly, Meena *et al.* (2015) [9] found that the average peak milk yield of buffaloes was 8.56±0.85 liter/animals in survey area. Ranjitha *et al.* (2020) [12] reported that fat and SNF values of murrah buffalo ranged from 7±0.14 to 7.54±0.05 and 8.31±0.06 to 8.47±0.02 percent, respectively.

Reproductive performance of dairy animals

Results pertaining to reproductive performance of dairy cattle and buffaloes are presented separately in subsequent sub heads.

Reproductive performance of dairy cattle

In relation to the reproduction performance of dairy cattle in Tribal and Non-Tribal area of Udaipur district, it was felt necessary to study the difference between Non-Tribal and Tribal area dairy farmers. To find out the difference in the reproduction performance of the dairy cattle in Non-Tribal and Tribal area, 'Z' test was applied.

Table 3: Reproductive performance of dairy cattle in Non-Tribal and Tribal area

S. No	Particulars	Cattle				'Z' value
		Non-Tribal (n=94)		Tribal (n=72)		
		Mean	S.D.	Mean	S.D.	
1.	Age at first calving (days)	1215.91	153.07	1372.34	135.80	6.96**
2.	Service period (days)	129.25	23.80	145.74	20.40	4.80**
3.	Calving interval (days)	394.06	40.31	461.24	26.94	12.21**
4.	Conception rate (%)	47.96	5.36	43.59	7.45	4.22**
5.	Dry period (days)	128.25	16.67	159.08	28.43	8.19**
6.	Heat period (hours)	15.64	2.74	14.10	2.48	3.78**
7.	Post-partum oestrus (days)	97.25	9.95	107.64	11.49	6.11**
8.	Gestation period (days)	284.64	12.13	286.52	13.68	0.62 ^{NS}

** Significant at 1 percent level of significance NS= Non significant n=No. of cattles

Data depicted in Table 3 indicated that calculated 'Z' value was found to be greater than its tabulated value at 1 percent level of significance for all the parameters of reproductive performance studied except gestation period. Thus, null

hypothesis (NH₀) was rejected and alternate hypothesis (RH₁) was accepted, which leads to the conclusion that there was highly significant difference in all the parameters of reproduction performance between Non-Tribal and Tribal

area dairy cattle except gestation period. In case of gestation period calculated 'Z' value was found to be less than its tabulated value at 1 percent level of significance. Thus, null hypothesis (NH_{01}) was accepted and alternate hypothesis (RH_1) was rejected, which leads to the conclusion that there was no significant difference in gestation period between Non-Tribal and Tribal area dairy farmers as this trait is genetically and physiologically governed trait hence there is no possibility of any variation than the normal limits decided by nature.

The mean value of age at first calving, service period, calving interval, dry period and post-partum oestrus in dairy cattle was 1372.34, 145.74, 461.24, 159.08 and 107.64 days, respectively in Tribal area. Corresponding values in Non-Tribal area were 1215.91 days, age at first calving, 129.25 days service period, 394.06 days calving interval, 128.25 days dry period and 97.25 days post-partum oestrus. The values of reproductive performance *viz.* age at first calving (days), service period, calving interval, dry period and post-partum oestrus were significantly higher in Tribal area than Non-Tribal area. The mean of conception rate and heat period in Non-Tribal area was 47.96% and 15.64 hours, respectively. In Tribal area it was significantly lower i.e. 43.59% conception rate and 14.10 hours heat period than Tribal area.

Similar findings were in accordance with the findings of Ekambaram *et al.* (2014) [5] who reported that the average age at first calving was 39.32 ± 2.99 months and the higher service period was reported as 122.04 ± 4.264 days in Tharparkar cattle. The average calving interval was 13.68 ± 2.55 months. The higher dry period was observed as 140 days in Gir cattle and 155.28 ± 9.65 days in Rathi cattle. Joshi *et al.* (2005) [16] reported that the onset of post-partum oestrus depends on suckling stage of calf, suckling reflex, milk yield, nutritional status of the animal and nourishment. The average duration of oestrus was 15.25 ± 1.67 hours. Duration of the oestrus period is dependent on the hormonal profile of the animal. Standing oestrus, also referred to as standing heat, is the most visual sign of each estrous cycle. The average gestation period was 282.14 ± 9.03 days.

Reproduction performance of dairy buffaloes in Non-Tribal and Tribal area

To find out the difference in the reproduction performance of the dairy buffaloes in Non-Tribal and Tribal area, 'Z' test was applied.

The data pertaining to reproductive performance of dairy buffaloes in Non-Tribal and Tribal area of the present study are presented in Table 4.

Table 4: Reproductive performance of dairy buffaloes in Non-Tribal and Tribal area

S. No	Particulars	Buffalo				'Z' value
		Non-Tribal (n=103)		Tribal (n=85)		
		Mean	S.D.	Mean	S.D.	
1.	Age at first calving (days)	1547.28	114.94	1624.88	183.37	3.39**
2.	Service period (days)	155.12	24.93	168.24	19.90	4.01**
3.	Calving interval (days)	427.74	48.01	478.06	31.50	8.63**
4.	Conception rate (%)	46.31	5.62	42.02	6.99	4.57**
5.	Dry period (days)	164.74	29.25	183.31	10.10	6.02**
6.	Heat period (hours)	17.72	2.91	16.60	3.56	2.62**
7.	Post-partum oestrus (days)	109.39	14.25	125.71	17.25	6.97**
8.	Gestation period (days)	313.82	17.51	315.68	15.06	0.78 ^{NS}

** Significant at 1 percent level of significance NS= Non Significant n=No. of buffalo

Data depicted in Table 4 indicated that calculated 'Z' value was found to be greater than its tabulated value at 1 percent level of significance for all the parameters of reproductive performance of buffaloes studied except gestation period. Thus, null hypothesis (NH_{01}) was rejected and alternate hypothesis (RH_1) was accepted, which leads to the conclusion that there was highly significant difference in all the parameters of reproduction performance between Non-Tribal and Tribal area dairy buffaloes except gestation period. In case of gestation period calculated 'Z' value was found to be less than its tabulated value at 1 percent level of significance. Thus, null hypothesis (NH_{01}) was accepted and alternate hypothesis (RH_1) was rejected, which leads to the conclusion that there was no significant difference in gestation period between Non-Tribal and Tribal area dairy farmers as this trait is genetically and physiologically governed trait hence there is no possibility of any variation than the normal limits decided by nature.

The mean value of age at first calving, service period, calving interval, dry period and post-partum oestrus in dairy buffaloes was 1624.88, 168.24, 478.06, 183.31 and 125.71 days respectively, in Tribal area. Corresponding values in Non-Tribal area were 1547.28 days, age at first calving, 155.12 days service period, 427.74 days calving interval, 164.74 days dry period and 109.39 days post-partum oestrus in buffaloes. The values of reproductive performance of buffaloes *viz.* age at first calving (days), service period,

calving interval, dry period and post-partum oestrus were significantly higher in Tribal area than Non-Tribal area. The mean of conception rate and heat period in Non-Tribal area was 46.31% and 17.72 hours, respectively. In Tribal area it was significantly lower i.e. 42.02% conception rate and 16.60 hours heat period in buffaloes as compared to Tribal area.

The findings are supported by Kale *et al.* (2017) [6] who reported that the average age at first calving of buffaloes was 45.05 ± 4.26 , 48.06 ± 4.89 and 48.60 ± 4.71 (in months), respectively in Haryana, Maharashtra and Odisha states. Average service period of buffaloes was 133.68 ± 19.56 , 148.39 ± 17.78 and 147.63 ± 18.05 days in Haryana, Maharashtra and Odisha states, respectively, Calving interval of buffaloes was 436.59 ± 18.99 , 448.44 ± 17.59 and 444.40 ± 18.70 days in Haryana, Maharashtra and Odisha states, respectively and the average dry period of buffaloes was 156.35 ± 30.04 , 184.06 ± 16.56 and 183.38 ± 16.95 in Haryana, Maharashtra and Odisha states, respectively.

Conclusion

The comparison of productive performance measures between Non-Tribal and Tribal areas for both cattle and buffalo reveals significant differences. In both cases, the Non-Tribal areas consistently demonstrate higher mean values for lactation length, total lactation milk yield, average milk yield per day, peak yield, and average milk solid-not-fat (SNF) compared to the Tribal areas. Whereas the mean values of average fat%

and days to attain peak yield were higher in Tribal areas. These findings highlight the superior productive performance of cattle and buffalo in Non-Tribal areas in terms of higher milk yield, shorter lactation length and SNF content. In terms of cattle, the Non-Tribal areas exhibit statistically significant advantages in various parameters, including age at first calving, service period, calving interval, conception rate, dry period, heat period, and post-partum oestrus. Similarly, for buffalo, the Non-Tribal areas demonstrate significant advantages in age at first calving, service period, calving interval, conception rate, dry period, heat period, and post-partum oestrus. These findings highlight the superior reproductive performance of cattle and buffalo in Non-Tribal areas, indicating more efficient breeding management and reproductive outcomes. The gestation period in both cattle and buffalo was found Non-significant as this trait is genetically and physiologically governed trait hence there is no possibility of any variation than the normal limits decided by nature.

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