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Title: **Persistency of Lactation, Lactation Yield, and Lactation Length in Thari Cattle at Thari Cattle Farm, Umerkot, Sindh**

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Persistency of Lactation, Lactation Yield, and Lactation Length in Thari Cattle at Thari Cattle Farm, Umerkot, Sindh

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ABSTRACT

Background. The current study was carried out to determine the persistency of lactation in Thari cattle, in view of the impact of heritability and seasons.

Method. The data on lactation length and lactation yield of Thari cattle (based on their 6 lactations) were collected for the period 2007-2017. To observe the effect of seasons on lactation persistency, the seasons were categorized as summer (April to September) and winter (October to March) for calved cows. The cows were grouped into four categories (A, B, C, and D) based on their sires to analyze the genetic effect on lactation persistency. The data were collected and analyzed using SAS software.

Results. The results for the persistency of lactation revealed that it was higher in 3rd lactation (51.43± 3.85 and 57.00±3.33%) and lower in 1st lactation (39.73± 7.26 and 43.67±5.78%) of summer and winter calvers, respectively. Similarly, sire-wise persistency of milk yield and lactation length was higher in Sire D daughters (1114.33±133.11, 216.4±3.54, and 73.09±7.60) and lower in Sire A daughters (1050.87±66.24, 193.8±7.56, and 58.62±8.10), respectively. Age-wise, it was higher in Sire D daughters 81-25 (61.81 ± 6.31) and lower in Sire A daughters 73-21 (37.39 ± 7.23), respectively. The heritability estimates for milk yield, lactation length, and persistency of lactation were observed as 0.22, 0.21, and 0.11, respectively.

Conclusion. The study found that the season of calving and lactation number significantly affect lactation yield, length, and persistency. On the other hand, there was no significant difference observed with reference to paternity. Lactation yield and length were higher in the 3rd lactation for both summer and winter calvers, while lower in the 1st

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lactation for both seasons. The heritability of milk yield, lactation length, and persistency was low, suggesting that improvements can be made through better management and by avoiding inbreeding.

Keywords: heritability, lactation, persistency, Thari cattle

Highlights

- Persistency of lactation in Thari cattle was observed.
- Heritability of persistency of lactation in Thari cattle was studied.
- Effect of age, lactation, calving season on persistency of location in Thari cattle were observed.

1. INTRODUCTION

Thari cattle are the famous cattle breed of District Tharparkar, Sindh. They are also found in various other parts of the Sindh province of Pakistan [1]. The Thari breed is a medium-sized, dual-purpose breed with a long face, convex forehead, normal-sized upward-curved horns, and large ears. This breed produces 1153 liters of milk in an average lactation length of 240 days. They have small and strong udders and are fairly good milk producers. Adult males weigh an average of 400 to 500 kg, while females weigh 300 to 380 kg [2].

The persistency of lactation can be defined as the most important trait of a milk producing animal. It indicates the level to which an animal constantly produces and maintains a higher amount of milk, month to month, during her lactation period. There are a number of factors that affect the persistency of lactation, such as environmental, genetic, management, lactation number, season of calving, and gestation period [3]. It has been reported that cattle have the ability to produce a greater amount of milk with a higher persistency of lactation, which obviously decreases production cost and increases the maximum net profit [4].

Heritability can be defined as a major genetic parameter that helps in the selection of higher performing and superior animal for breeding purposes to obtain particular desirable traits, such as better milk and meat, in the future [5]. Genetic parameters are important to understand the genetic makeup of a population and play a major part in the breeding and conservation of genetic resources. The persistency of lactation can be affected by genetics, as well as management practices, and by improving the nutrition of farm animals. Animals with high persistency of lactation are preferred because they provide stable milk production and also decrease the risk of rapid inbreeding [3]. Keeping in the view the importance of the persistence of lactation and factors influencing it, such as the environment and genetics, this study was designed to observe the lactation persistency of Thari cattle breed of Sindh, Pakistan.

2. MATERIALS AND METHODS

The current study was performed to observe the persistency of lactation and the heritability estimates of the persistency of lactation, lactation length, lactation yield, and seasonal effect on the performance of Thari cattle maintained at the Government Thari Cattle Farm, Umerkot, Sindh. The data used in the current study was collected for a period of ten years, that is, 2007-2017.

2.1. Data Collection

The performance records of Thari cattle maintained at Government Thari Cattle Farm, Umerkot, Sindh were collected and analyzed. The data was collected via a proforma, specially prepared for this study (Appendix VII). The record available on lactation length and lactation yield of Thari cattle (based on their 6 lactations) was collected for the period 2007-2017. In order to observe the effect of seasons on the persistency of lactation, the seasons were categorized into summer and winter. The summer season (for cows that have calved) extended from April to September and the winter season (for cows who have calved) extended from October to March. To analyze the effect of genes on the persistency of lactation, the cows under study were grouped into four different groups according to their sires, namely A, B, C, and D. The data was collected and analyzed with the help of SAS software.

2.2. Persistency of Lactation

The persistency of lactation was estimated with the formula suggested [6].

$$\text{Persistency (\%)} = \frac{\text{Milk yield in 28 weeks-Milk yield in first 14 weeks}}{\text{Milk yield in first 14 weeks}} \text{X100}$$

2.3. Heritability

The heritability estimate for the persistency of lactation, milk yield, and lactation length was calculated using the formula suggested by [6].

3. RESULTS

3.1. Effect of Seasons on Lactation Yield in Thari Cattle

The results for milk yield revealed that maximum milk yield was observed in the 3rd lactation in summer and winter seasons (539.31±9.65 and 549.31±49.47 liters), respectively. Whereas, it was minimum in the 1st lactation in summer and winter seasons (507.83±7.25 and 511.83±8.36 liters, respectively. The details are presented below in Table 1.

Table 1. Season-wise Lactation Yield in Thari Cattle

Lactation	Summer	Winter
1st Lactation	507.83±7.25	511.83±8.36
2nd Lactation	519.88±5.70	529.88±6.60
3rd Lactation	539.31±9.65	549.31±49.47
4th Lactation	533.45±14.09	541.45±11.21
5th Lactation	521.19±10.32	536.95±15.56
6th Lactation	512.51±23.32	523.51±14.52
Overall	521.98±61.15	531.65±73.28

3.2. Effect of Seasons on Lactation Length in Thari Cattle

The results revealed that the maximum lactation length was observed in the 3rd lactation in summer and winter calvers (187+15.15 and 176.6+8.89 days), respectively. Whereas, it was minimum in the 1st lactation in summer and winter calvers (151.93+9.83 and 149.66+9.12 days), respectively. The details are presented below in Table 2.

Table 2. Season-wise Lactation Length in Thari Cattle

Lactation	Summer Calvers	Winter Calvers
1st Lactation	151.93+9.83	149.66+9.12
2nd Lactation	157.86+9.42	157.93+8.37
3rd Lactation	187+15.15	176.6+8.89

Lactation	Summer Calvers	Winter Calvers
4th Lactation	181.26+8.55	171.8+9.09
5th Lactation	178.43+6.24	167.10+7.75
6th Lactation	153.30+5.22	154.05+6.22
Overall	167.11±4.42	162.29±4.78

3.3. Season-wise Persistency of Lactation (%) in Thari Cattle

The results revealed that a higher persistency of lactation was found in the 3rd lactation of summer and winter seasons (51.43±3.85% and 57.00±3.33%), respectively. Whereas, it was lower in the 1st lactation of summer and winter seasons (39.73±7.26% and 43.67±5.78%), respectively. The details are presented below in Table 3.

Table 3. Season-wise Persistency of Lactation (%) in Thari Cattle

Lactation	Summer Calvers	Winter Calvers
1st Lactation	39.73± 7.26	43.67±5.78
2nd Lactation	41.22± 4.42	47.30±4.36
3rd Lactation	51.43± 3.85	57.00±3.33
4th Lactation	37.36± 2.94	51.97±2.23
5th Lactation	31.17± 3.47	46.71±3.42
6th Lactation	29.82± 2.22	35.28±2.50
Overall	38.79 ±7.27	46.38±7.30

3.4. Sire-wise Milk Yield, Lactation Length, and Persistency of Lactation of Thari Cattle

The sire-wise milk yield, lactation length, and persistency of lactation revealed that the higher lactation yield, lactation length, and persistency of lactation were found in Sire D daughters (1114.33±133.11, 216.4±3.54, and 73.09±7.60), whereas it was lower were found in Sire A daughters (1050.87±66.24, 193.8±7.56, and 58.62±8.10), respectively. On the other hand, the effect of sire (A, B, C, and D) on the persistency of lactation (%) in their daughters was found to be non-significant (p>0.05). The details are stated below in Table 4.

Table 4. Sire-wise Average Milk Yield, Lactation Length, and Persistency of Lactation in Thari Cattle

Sire	Lactation Components		
	Milk Yield (Liters)	Lactation Length (days)	Persistency (%)
A	1050.87 ±66.24	193.8±7.56	58.62±8.10
B	1053.71 ±13.11	204.8±7.35	61.62±8.31
C	1080.20 ±55.49	211.13±4.38	67.63±8.02
D	1114.33 ±133.11	216.4±3.54	73.09±7.60
Overall	1211.16 ±789.01	221.88±8.13	71.74±7.94

3.5. Effect of Age on the Persistency of Lactation

The results revealed that the effect of age on persistency of lactation was higher in the daughters of Sire D, with an average age of 81 (61.81 ± 6.31). Whereas, it was lower in the daughters of Sire A, with an average age of 73 (37.39 ± 7.23). The results are presented below in Table 5.

Table 5. Age-wise Persistency of Lactation (%) of Daughters of Different Sires

Sire	Age-wise Persistency of Lactation	
	Age (months)	Persistency (%)
A	73-21	37.39 ± 7.23
B	77-13	49.71 ± 9.20

C	89-9	53.41 ± 0.11
D	81-25	61.81 ± 6.31

3.6. Heritability Estimates

The heritability estimates for lactation yield, lactation length, and persistency of lactation were 0.22, 0.21, and 0.11, respectively. The results showed that the heritability estimates remained low. The details are listed below in Table 6.

Table 6. Heritability Estimates of Some Performance Traits of Thari Cattle

Performance Traits	Heritability
Lactation yield	0.22
Lactation Length	0.21
Persistency of lactation	0.11

4. DISCUSSION

In the current investigation, persistency of lactation, heritability estimates of the persistency of lactation, and seasonal and sire influence on the persistency of lactation in Thari cattle were analyzed. The findings showed that the persistency of lactation of Thari cattle maintained at the Government Thari Cattle Farm, Umerkot, Sindh was 71.74 ± 7.94. A number of researchers previously stated that the maximum and minimum levels of the persistency of lactation (breed-wise) were observed to be different in different breeds of buffalo and cows including Jersey (82.6), Nili Ravi (87), Anatolian buffalo (85.22), Buffalypso (81.62), and Karan Fries (87.34) [7, 8]. The findings of [9] are higher than the results of the current study, which determined the persistency of lactation as 89.38% in Holstein. The differences in the results may be due to genetic and non-genetic factors which include breeds, sires, season, and other differences [10].

The persistency of lactation in cattle depends on the availability of pasture and green fodders during the lactating period. The summer season can greatly influence the growth rates of pasture and green fodders, which ultimately affects the lactation yield, as well as persistency of lactation, in Thari cattle [11]. Calving season also has a significant effect on persistency of lactation in Thari cattle. The animals that calved in winter were more persistent than summer calvers. The findings of [12] also reported that winter calvers were more persistent than that of summer calvers. However, a study [13] revealed that the Nili Ravi buffaloes who calved in the hot and humid season were more persistent. It has been reported by [14] that cows calving during the winter season have the ability to be more persistent due to the availability of better feeding during the first three to four months of lactation.

Moreover, [15] and [16] reported that heritability estimate for the persistency of lactation in Thari cattle was recorded as 0.11. The results of this investigation approximate such findings. Another study [17] reported higher values for heritability estimates for the persistency of lactation, as compared with the results in Iranian Holstein, Israeli Holstein, and Canadian Holstein breed. It might be due to the differences in management patterns and environmental conditions [18]. The heritability estimates for lactation yield and lactation length in Thari cattle were 0.22 and 0.21, respectively. The values are higher than the findings of [12], who reported that heritability for lactation length ranged from 0.03 to 0.04 in Iranian Holstein. The findings of [11] were also higher than the current study, which reported heritability estimate for lactation length as 0.09 in Holstein Friesian. Whereas, the heritability estimate for lactation yields of Holstein Friesian cattle

was 0.094. A number of factors affect the performance of animals, such as age, season of calving, effect of nutrition, and management. In a high-temperature environment, the heat level in the animal's body increases, leading to a rise in the body temperature. It has been reported that a high body temperature of animals decreases their productive ability due to heat radiation which directly affects their feed, water consumption, body weight, milk production, lactation length, and body metabolism [15].

4.1. Conclusion

It was concluded that the season of calving and lactation number have a significant effect on the persistency of lactation, lactation yield, and lactation length. Whereas, sire has no significant influence on the persistency of lactation. Furthermore, the heritability estimates for lactation length, lactation yield, and persistency of lactation remained relatively low. This was due to environmental conditions and poor management practices.

CONFLICT OF INTEREST

The author of the manuscript has no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

DATA AVAILABILITY STATEMENT

The data associated with this study will be provided by the corresponding author upon request.

FUNDING DETAILS

No funding has been received for this research.

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