ANALYSIS OF THE PERSISTENCY OF LACTATION IN RED SINDHI CATTLE

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ABSTRACT:*The study was conducted to analyze the Persistency of Lactation and factors affecting on persistency of Red Sindhi Cattle by using 168 lactation records for the period of 2007-2012 (06 years) at Red Sindhi Cattle Breeding Farm, Tando Mohammad Khan. The higher average persistency of lactation was observed in 3rd lactation whereas lower in 1st lactation of both summer and winter calvers. Average persistency of lactation was observed 61.31±2.00% in summer calvers and 61.83±2.095% in winter calvers, while effect of season of calving was found non-significant (p>0.05). High persistency of lactation was observed in the daughters of Sire-A followed by Sire-D, Sire-B and Sire-C. The overall average persistency of lactation in Red Sindhi Cattle was observed 61.55 ± 2.06%. Effect of sire on persistency of lactation was observed non-significant (p>0.05). The corresponding estimate of heritability for persistency of lactation was low (0.075). The high correlations were observed between lactation milk yield and persistency of lactation (0.610), lactation length and persistency of lactation (0.665). It is concluded from the present study that the persistency of lactation and heritability estimates of performance traits were relatively low. Low and medium heritable traits were affected by environmental conditions and poor management practices.*

Key Words: Correlation, Heritability, Persistency of Lactation, Red Sindhi Cattle

INTRODUCTION

Agriculture sector contributes as largest sector in the economy of Pakistan, most of the population depends on this sector directly and indirectly. Agriculture sector adds 21% in Gross Domestic Product (GDP) in which 11.9% share of Livestock [1] that means livestock sector contributes about 55.52% of total agriculture values of Pakistan. Livestock is a renewable natural resource which provides essential items of human diet in the form of milk and meat. Red Sindhi cattle are the most popular of all Zebu dairy breeds. This breed also known as Sindhi Cattle, Red Maliri Cattle, originated in the Sindh province of Pakistan and well adapted to tropical and semi-arid climatic conditions of Thatta, Hyderabad, Karachi and Lasbella. Due to resilience to harsh environment and diseases, this breed is widely kept for milk production across Pakistan, India, Bangladesh, Sri Lanka and other countries. This breed is being used for crossbreeding with temperate (European origin) breeds in many countries to combine their tropical adaptations.

Persistency of lactation is considered an important trait of dairy cattle. This can be defined as; persistency of lactation is the ability of a cow to maintain her quite constant milk production during her lactation [2]. According to the definition of [3], they reported that persistency of lactation is the ability of a cow to produce milk continuously at a level after reaching the peak of her lactation. Animals with greater level of persistency are considered as more profitable and economical. Lactation persistency is affected by genetic and environmental factors such as lactation number, management, feeding, season of calving and breeding practices [4]. The persistency of lactation in Red Sindhi Cow has been calculated with the formula as suggested by [5].

Heritability estimates refer to that proportion of the phenotypic variance in a population that is due to heredity. Heritability is an important factor used to predict the genetic growth for improvement of selected trait. From the calculations of heritability an attempt is made so that particular trait can be improved by genetic selection or by improved management conditions or both.

Persistency of lactation is considered a very important characteristic for dairy animal. Animals producing milk at greater level of persistency are considered as economical in dairy industry, because this would reduce and stabilize production cost and ultimately maximize profit [6]. Therefore, it is important to have improvement in lactation persistency. Heritability estimates refers to that portion of the phenotypic variance in a population that is due to heredity. From the calculations of heritability an attempt is made to estimate the degree of correlation between the phenotype and genotype of individual in a population [7].

MATERIAL AND METHODS

Weekly milk record of 168 lactations of Red Sindhi Cattle sustained at Red Sindhi Cattle Breeding Farm, Tando Mohammad Khan for the period of 2007-2012 (six lactations of each) were collected and analyzed. Cattle were naturally mated and milking was done by hand, twice a day at farm. Normal complete records of the cows were included in the study and incomplete records were discarded. If the lactation record of any week was missing that was adjusted by averaging pervious and next week's available record. However, records missing for more than eight weeks were not included in analysis (as suggested by [8]. To estimate the seasonal influence on persistency of lactation, seasons were separated by summer and winter. In each season equal numbers of cattle were utilized for the evaluation. The seasons were divided as summer (for cows calved from April to September) and winter (for those cows that calved from October to March). To estimate genetic effect on persistency of lactation, cows were divided in to four groups as Group-A (Shan-2), B (Ranjho-86), C (Manik-307) and D (Naseem-303) according to their sires.

Method for Calculation of Persistency of Lactation

The following method was used for calculating the persistency of lactation.

$$\text{Persistency}\,(\%) = \frac{(\text{Milk Yield in 28 weeks} - \text{Milk Yield in First 14 weeks})}{\text{Milk Yield in First 14 weeks}} \times 100$$

Method for Estimation of Heritability of Persistency of Lactation

The following method was used for estimating the heritability of persistency of lactation.

$$h^2 = \frac{4\sigma_s^2}{\sigma_s^2 + \sigma_w^2}$$

Where;

h^2= Heritability estimate

σ_s^2= Variance between sires

σ_w^2= Remainder of the variance

RESULTS AND DISCUSSION

The parity wise average values for persistency of lactation are given in Table 1. Average persistency of lactation in Red Sindhi Cattle for summer and winter calvers were 61.31±2.00% and 61.31±2.09%, respectively. The average higher persistency of lactation was observed in 3rd lactation while lowest values were observed in the 1st lactation of both summer and winter calvers. Many studies have been reported by the different researchers on persistency of lactation in different breeds. The findings of [8, 9, 10, 11 were higher than the results of present study, who reported persistency of lactation 90.5% in Holstein cattle, 81.62% in Buffalypso breed, 87% in Nili-Ravi and 87.34±1.27% in Karan Fries cow. Usually, exotic cows and buffaloes were more yielding animals and were more persistent than the *Bos indicus* cows. Dubey and Singh [12] also reported higher results for persistency of lactation in Indian Sahiwal Cattle (72.65%). The findings of Dubey and Singh (2014) are fairly comparable with present study. They reported persistency of lactation to be 68.73% in Indian Red Sindhi Cattle and 63.65% in Indian Hariana cattle. The effect of calving season was found non-significant on the persistency of lactation in Red Sindhi Cattle (p>0.05). The result of this investigation was in conflict with the findings of [13, 14, 15, 16]. They reported significant effect of season of calving on persistency of lactation in different breeds. This difference in findings may be due to small number of animals investigated, genetic potential of this breed, tolerant to harsh climatic conditions, as some breeds were tolerant to lower and higher temperatures. The Zebu cattle or dual-purpose cattle have good ability to adapt the tropical and harsh climatic conditions and can produce well milk per lactation [17,18]. These results are also in accordance with [19].

Sire wise overall average persistency of lactation in Red Sindhi Cattle are presented in Table 2. Overall average persistency of lactation was 61.55±2.06% in Red Sindhi Cattle. The sire effect on persistency of lactation in Red Sindhi Cattle was non-significant (p>0.05).

Table – 1. Average Persistency of Lactation (%) in Red Sindhi Cattle.

Parity	Summer Calvers	Number of Calving	Winter Calvers	Number of Calving
1st Lactation	$60.00^{ns} \pm 0.38$	15	$60.38^{ns} \pm 0.51$	13
2nd Lactation	$60.50^{ns} \pm 0.63$	16	$61.33^{ns} \pm 0.89$	12
3rd Lactation	$65.00^{ns} \pm 0.94$	17	$66.27^{ns} \pm 1.27$	11
4th Lactation	$61.73^{ns} \pm 0.79$	11	$62.00^{ns} \pm 1.27$	17
5th Lactation	$60.25^{ns} \pm 0.46$	09	$61.05^{ns} \pm 0.83$	19
6th Lactation	$60.05^{ns} \pm 0.59$	23	$60.14^{ns} \pm 0.38$	05
Overall	**$61.31^{ns} \pm 2.00$**	**91**	**$61.83^{ns} \pm 2.09$**	**77**

ns=T-Statistics non-significant (p>0.05)

These variations in values might be due to the environmental conditions and management patterns at that area where the studies were done. Sample size and method to calculate the persistency of lactation may also fluctuate the results. The sire effect on persistency of lactation was also non-significant (p>0.05). Results of [20, 21] are in conflict with the current investigation, who reported the significant effect of sire on various lactation components. This difference may be due to the sire group within the same herd/population at the farm. Findings of [22, 23] are in agreement with present study.

Heritability estimate for persistency of lactation was 0.084 in Red Sindhi Cattle (Table 2). The heritability estimates were at the lower end of the range, in comparison with most others studies for different breeds. However, the low estimates for persistency of lactation as in the present study are fairly close to those of [11, 15, 24, 25, 26, 27, 28 29] who reported the heritability estimates for persistency of lactation ranging from 0.01 to 0.25 in Karan Fries, Holstein, Germen Holstein, Irani Hostein and Brazlian Gyr Cow. The difference in the heritability estimates of present study and those of other investigations might be due to the difference of breeds, size of the data set, analysis and methodology used for calculating heritability estimates.

Table – 2 Sire Wise Average Persistency of lactation (%) in Red Sindhi Cattle.

SIRE	Persistency (%)
A	61.67 ± 1.96^{ns}
B	61.45 ± 2.07^{ns}
C	61.45 ± 2.18^{ns}
D	61.64 ± 2.08^{ns}
Overall	**61.55 ± 2.06**
Heritability	**0.084**

ns= Non-Significant (p> 0.05).

High correlation was observed between lactation milk yield and persistency of lactation (0.610) and lactation length and persistency of lactation (0.665) (Table 3). Results of [8, 22,

24] are in agreement with the present study. They reported that lactation milk yield and persistency of lactation were highly correlated.

Many factors are responsible for changeability in estimates, such as management and different seasonal conditions, which may hide the genetic potential. This decrease in the persistency of lactation and heritability might have association with the feeding patterns, management and environmental conditions provided at the farm.

Table 3: Correlation Co-efficient Among Lactation Components of Red Sindhi Cattle

Lactation Components	Correlation Coefficient
Lactation Milk Yield × Lactation Persistency	0.610
Lactation Length × Lactation Persistency	0.665

CONCLUSION

It is concluded from the present study that persistency of lactation in Red Sindhi Cattle was lower, while effect of season and sire was non-significant on it. The estimates of heritability for persistency of lactation are relatively low. Low values of heritability indicate that performance of herd was very low, therefore it is necessary to improve the feeding and management, which will bring about the greatest returns in the direction of improved persistency. The correlation among lactation milk yield and persistency of lactation was high.

REFERENCES

[1] Farooq Omer. 2014. Economic Survey of Pakistan 2013-14. Chapter-II. Agriculture. Ministry of Finance. Finance Division. Pak. Sectt. Islamabad. Pakistan. Pp. 23–41.

[2] Starbel T, Kopachi W, Szwaczkowski T. 1994. Genetic Evaluation of Persistency in Random Regression Test Day Model. INTERBULL Bulletin. xNo. 27: 189-192.

[3] Jamrozik J, Jansen G, Schaeffer L R, Liu Z. 1998. Analysis of Persistency of lactation calculated from a random regression test-day model. INTERBULL *Bulletin* No. 17. 6-69.

[4] Leon-Velard C U, Mcmillan I, Gentry R D, Wilton J. 1995. Models for estimating typical lactation curves in dairy cattle. J. Anim. Breed. Genet. 112: 333-340.

[5] Ludwick T M, Peterson W R. 1943. A measurement of persistency of lactation in dairy cattle. J. Dairy Sci. 26: 439-445.

[6] Tekerli M, Kucukkebabci M, Akalin N H, Kocak S. 2001. Effects of Environmental Factors on Some Milk Production Traits, Persistency and Calving Interval of Anatolian Buffaloes. Livestock Production Sciences. 68 (1-2): 271-281.

[7] Lasley, J.F. 1972. Genetics of Livestock Improvement. 2nd Edi. Prentice-Hall Inc. Englewood Cliffs, New Jersey. Pp. 132 – 135.

[8] Chaudhry H Z, Khan M S, Mohammad G, Mustafa M I. 2000. Persistency of lactation in Nili-Ravi Buffaloes. Int. J. of Agri. and Biol. 02(3): 207-209.

[9] Nazir A, Syed M, Farooq M, Shah S I, Gill R A. 2003. Lactation Yield, Length and Persistency of Lactation in Holstein Cows under the Subtropical Environment of North West Frontier Province (NWFP). J. Anim. and Vet. Advances. 2(10): 548-553

[10] Méndez M, Fraga L M, Orta M. 2013. Lactation persistency in buffalo herds in granma province, cuba. Cuban Journal of Agricultural Science. 47(3): 237-241

[11] Kumar A, Singh V. 2005. Genetic evaluation and reliability of persistency of milk production in Karan Fries. Indian Society of Animal Genetics and Breeding. Pp.6.

[12] Dubey C N, Singh S. 2014. Comparison of persistency and peak yield for selected breeds of cow existing in District Varanasi of Uttar Pradesh. J. Envir. and Ecol. 32(2):532-535

[13] VanRaden P M, Dematawewa C M B, Pearson R E, Tooker M E. 2006. Productive life including all lactations and longer lactations with diminishing credits. J. Dairy. Sci. 89: 3213 – 3220.

[14] Tekerli, M., Akinci Z., Dogan, J. and Akcan A. 2000. Factors Affecting the Shape of Lactation Curves of Holstein Cows from the Balikesir Province of Turkey. J. Dairy Sci., 83:1381-1386.

[15] Mohamed M A E. 2010. Lactation Persistency and Prediction of TotalMilk Yield from Monthly yields in Egyptian Buffaloes. LucrăriŞtiinţifice, SeriaZootehnie. (53): 242-249.

[16] Kumar. A. and V. Singh. 2005. Genetic evaluation and reliability of persistency of milk production in Karan Fries. Indian Society of Animal Genetics and Breeding. Pp.6.

[17] Preston T R, Leng R A. 1987. Matching livestock production systems to available resources in the tropics and sub-tropics. Penambul Books, Armidale.

[18] Roman-Ponce. H. 1987. Lactation of dairy cattle in humid tropical environments. In "World Animal Science, B5, Bioclimatology and the adaptation of livestock". pp. 81–92.

[19] Mustafa M I, Latif M, Bashir M K, Ahmad B. 2002. Productive performance of Red Sindhi Cattle under hot and humid environment of Balochistan province of Pakistan. Pak. Vet. J. 22 (4): 151-157

[20] Nawaz A, Nizamani A H, Marghazaini I B, Nasrullah, Fatih A. 2013. Influence of Genetic and Environmental Factors on Lactation Performance of Holstein Friesian Cattle in Balochistan. *J.* Anim. Plant Sci. 23 (sup 1): 17 – 19

[21] Yadav, A.S. and S.S. Rathi. 1991. Genetic Evaluation of Some Performance Traits in Hariana Cattle. Asian J. Dairy Res. 10(2): 103-110

[22] Shafiq M, Babar M E, Rehman A, Ahmed G. 1994. Factors Affecting Total Milk Yield, Yield up to Peak and Persistency of First Lactation in Sahiwal Cows. Pak J. Agri. Sci. 3 (3): 228 – 232.

[23] Usman T, Guo G, Suhail S M, Ahmed S, Qiaoxiang L, Qureshi M S, Wang Y. 2012. Performance Traits Study

of Holstein Friesian Cattle under Subtropical Conditions. J. Anim. Plant Sci. 22 (Sup 2): 92 – 95

[24] Atashi H, Shahrbabak M M, Mohammadi A A. 2006. Study of Some Suggested Measures of Milk Yield Persistency and Their Relationships. Int. J. Agri. & Biol. 08 (3):387–390.

[25] Harder B, Bennewitz J, Hinrichs D, Klam E. 2006. Genetic Parameters for Health Traits and their Relationship to Different Persistency Traits in German Holstein Dairy Cattle. J. Dairy Sci. 89: 3202 – 3212.

[26] Macciotta N P P, Vicario D, Cappio-Borlino A. 2006. Use of Multivariate Analysis to Extract Latent Variables Related to Levelof Production and Lactation Persistency in Dairy Cattle. J. Dairy Sci. 89:3188–3194.

[27] Cole J B, Null D J. 2009. Genetic evaluation of lactation persistency for five breeds of dairy cattle. J. Dairy Sci. 92(5): 2248-58.

[28] Cobuci J A, Costa C N. 2012.Persistency of lactation using random regression models and different fixed regression modeling approaches. R. Bras. Zootec. 41 (9): 1516-1590.

[29] Pereira R J, Verneque R S, Lopes P S, Santana M L J, Lagrotta M R, Torres R A, Vercesl Filho A E, Machado M A. 2012. Milk yield persistency in Brazilian Gyr cattle based on a random regression model. Genet. Mol. Res. 11(2): 1599-1608.