Research Article

Performance evaluation of Holstein Frisian cattle under subtropical environment

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Abstract

To evaluate the productive performance of Holstein Friesian cattle maintained at Government Dairy Farm Quetta. For this study the data were collected and utilized for the period of 2006 to 2013. In this study the parameters including effect of sire, parity, effect of season and calving year were under the study. While the heritability and repeatability was analyzed with the method of data analysis. In current study result for milk yield showed that higher milk yield and lactation length were observed in spring season as compared to other seasons. The results of heritability and repeatability for milk yield, lactation length and dry period were low, medium to high. In this study effect of calving season was observed significantly on above traits with low and moderate results of heritability estimate, it is concluded that milk yield, lactation length and dry period are highly influenced by environmental factors.

Keywords: Performance traits; Holstein Frisian; Subtropical environment

Introduction

Livestock sector of Pakistan serves as back of the national economy, however Pakistan has large number of better dairy animal breed, but due to unawareness regarding the utilization of genetic potential of these animals, now these breeds are known as low milk producer breeds [1]. It is real fact that milk production of these animals can be enhanced either increasing the number of dairy animals or by improving the management practices and

changing the environmental conditions [2]. It has been reported that improving the management practices and environmental conditions can play a vital role for producing more effective genetic potential of these dairy breeds [3]. Crossbreeding program is important mating system through this system non descriptive and local breeds of dairy animals can be cross for getting higher genetic potential for fast and better improving method. Due to shortage of higher

milk producing dairy animal's Pakistani government started to establish various dairy farms of high milk yielding dairy animals such as Jersey and Holstein Frisian in various localities of Pakistan [1]. Heritability is major genetic parameter which represent possible amount of genetic change for different selected traits and repeatability can be defined as inferiority or superiority of any trait that could consider for expression in future [2]. There are number of genetic and environmental factors, which can enhance or reduced the production of these dairy animals, hence this study was designed to evaluate the effect of environment on the performance of Holstein Frisian cows maintained at government dairy form. Quetta.

Material and methods

Data source

Current study was carried out at department of Animal Breeding & Genetics, Sindh Agriculture University, Tandojam, during the year of 2016. For this purpose data of performance traits including milk yield, lactation length and dry period of Holstein Frisian for the period of 2006 to 2013.

Experimental design & statistical model

In this study the data were analyzed with help of (GLM) General linear model procedure, while standard error and arithmetic mean for milk yield lactation length and dry period.

Heritability and repeatability

The estimation of genetic parameters such as heritability and repeatability were worked out using the formula as suggested by (Becker, 1985).

Results

Milk yield

The least square and unadjusted mean was found 338.4 ± 43.4 kg and it ranges from 2022 kg to 6647 kg with variation of coefficient of 33.81, described in (Table 1). The significant effect of parity was observed significantly higher ($P \geq 0.05$). While the effect of season,

sire and calving were observed non-significant on milk yield, details are presented in (Table 2). In this study the parity number 7th had highest production of milk yield as compared to other parties with 4288 kg. The cows which were calved during the spring season had produced higher production of milk as compared to those cows which were calved during other season. The results of heritability and repeatability estimation for milk yield were observed moderate 0.244 ± 0.238 and 0.21 ± 0.71 ; respectively details are mentioned in (Table 1).

Lactation length

In present study the average lactation length of Holstein Frisian cattle ranged 183 to 511 with mean 356.97 ± 76.32 days with variation of coefficient of about 20.93%, details are described in (Table-1). The effect of season of calving on lactation length was observed non-significant, details are presented in (Table-2). The results of heritability and repeatability estimation for lactation length were observed low 0.19 ± 0.152 and 0.189 ± 0.186 , respectively; details are mentioned in (Table 2).

Dry period

In this study average dry period was observed 98.12 ± 51.3 days and it ranges 3- to 225 days with variation of coefficient 35.11%, details are described in (Table 1). The effect of season and sire on dry period was found significantly higher ($P \leq 0.05$), while the effect of year of calving and parity were observed non-significant on dry period; details are given in (Table 2). The cow that had been calved during the fall season produces lower production of milk as compared to the cows, which have calved in other season. The results of heritability and repeatability estimation were observed moderate 0.61 ± 0.104 and 0.189 ± 0.086 , respectively; details are mentioned in (Table 1).

Table 1. Performance traits of Holstein Frisian cattle mean standard deviation, range, coefficient of variation, heritability and repeatability

Trait	Mean Standard Deviation	Range (-) (+)	Cv%	(h ²)	(r)
Milk Yield	338.4±34.4	2022-6447	23.81	0.244±0.238	0.251±0.07
Lactation length	356.97±76.32	183-511	20.93	0.19±0.152	0.189±0.168
Dry Period	98.15±51.3	30-255	35.11	0.61±0.104	0.189±0.86

Table 2. The analysis of variance for performance traits of Holstein Frisian cattle

	(DF)	(MS)	(P)	(DF)	(MS)	(P)	(DF)	(MS)	(P)
Season	3	1131048.45	0.109	3	16702.74	0.029	3	13577.74	0.034
Parity	8	1656077.45	0.035	8	3566.24	0.610	7	10550.54	0.051
Sire	6	681401.31	0.426	6	4253.96	0.482	6	12471.03	0.010
Year	9	263534.62	0.854	9	2028.11	0.944	8	49683.6	0.319
Residual	115	776122.77	-	115	57783.57	-	24	4955.26	-
Total	141	-	-	141	-	-	141	-	-

Discussion

Milk yield

The average milk yield reported by [4-6] 2772.76 to 3710 kg, the findings of above mention author are in agreement with finding of current study. [7], [8] reported that season of calving and parity had significant effect on the production of milk. In current study higher milk was observed in parity number 7th may be due to low availability of data. It has been reported by [7, 9] that higher milk yield was observed in 2nd and 3rd parity. Author has described that adaptability and performance of temperate were not observed better in subtropical areas. In our study higher milk production was observed in spring season and fall that indicates that better environmental temperature was suitable for Holstein Frisian in spring and fall season. Lower production of milk yield in summer may be due to heat stress and low availability of green fodder. Due to lower production during the summer season efforts are required to reduce environmental stress and amount of fresh air flow should be increased for higher production of animals. Whereas effect of calving year and sire was non-significant showing that there was no

improvement made by sire and year. Hence due to this purpose imported semen from temperate areas can be used to increase the effectiveness of sire effect [10]. Author has reported that increased in environmental temperature caused stressful condition for dairy animals, hence supply of fresh air is necessary for getting stress free environment. The results of heritability estimates observed low to moderate in our study, the findings of [11-13], who have also reported moderate results of heritability estimation ranges from 0.06 to 0.47, 0.21, to 0.04, similar results were found repeatability estimation by [6, 14, 15], who had reported low repeatability estimation for milk yield. That is may be due to unfavorable environmental conditions or low mount of data available. The different among above mention studies may be due to variation in environmental as well as management conditions of farm. According to [4, 6] who had also reported higher milk yield during spring season, they have reported that due to favorable environment and availability of fresh green fodder animals produces more amount of milk as compared to other seasons that is why the results for

heritability and repeatability estimations were moderate to high in both researches.

Lactation length

Different author had been reported average lactation length range from 291.86 to 362 by [4, 7, 11], the findings of lactation length in our study were also in agreement with above mention studies. The results of [10], are controversial than findings of current study, who had reported had significant effect on lactation length, while higher lactation length was observed relatively in those cows, which had calved in winter and fall. The mention difference among the studies may be due animal's sensitiveness to seasonal variation and also better feeding practices can also be the reason of early conception cause subsequent calving. It has been reported that repeat breeding, improper timely insemination and absence of heat are major reason for higher lactation length in cows. The findings for heritability and repeatability of [10, 16], are in also agreement, they had also reported moderate results for heritability and repeatability estimations 0.181 ± 0.162 and 0.06 0.22 to 0.6 for lactation length, similar statement described by [14, 17] due to low estimation of heritability and low results for repeatability indicates that higher amount of environmental influence were found on the lactation length.

Dry period

The findings of [5, 19] reported dry period ranges between 129.63 to 281.33 While the results of dry period in current study was observed lower as compared to above mentioned researches. [19], reported that effect of season and sire were observed non-significant on dry period. It has also been reported by many researchers that low dry period in cows was observed due their drying up time happened in summer and fall with low availability of green fodder and high environmental temperatures. For the improvement of dry period authors had been suggested that better management can results

in the betterment of reproductive traits and will definitely cause low dry period, low calving interval and brings profitability in farm. The results of heritability and repeatability in current study was found moderate for dry period, while findings of [19, 20] reported higher values for heritability and repeatability estimation such as 0.101 ± 0.21 and 0.08 ± 0.08 for dry period in Jersey and Holstein Frisian cattle. While findings of [5, 21] they had also reported moderate values

Conclusions

In current study due to low and moderate values for heritability and repeatability, it is concluded that these traits are highly influenced by environmental effects, so it is better to reduce environmental stress (heat stress) and fresh air flow should be provided during the summer season for better production.

Author's contributions

Conceived and designed the experiments: HA Kaleri & SK Baloch. Performed the experiments: MA Baloch, A Kaleri, SA Umarni, GM Mari & A Mari. Analyzed the data: RR Kaleri, MA Gopang & IH Kakar. Contributed reagents/ analysis/ tools: RR Kaleri. Wrote the paper: HA Kaleri & RR Kaleri.

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