PRODUCTIVE PERFORMANCE OF HOLSTEIN-FRIESIAN KEPT IN BALOCHISTAN, PAKISTAN

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The Holstein Friesian has been rated as top milk producer number one cattle in the world as far as the yield is concerned. Their productive potentials are excelled in USA and other European countries. The same were imported to meet the milk demands of the developing countries like Pakistan. One thousand cattle imported from Denmark in 1977-78 by Pakistan Government, were kept at Government Dairy Farms in Balochistan Province at seven locations viz; Kalat, Khuzdar, Loralai, Mustung, Pishin, Quetta and Zhob. This study was planned to explore their productive performance regarding the birth weight (BWT), lactation length or days in milk (DIM) and milk yield (MY) kept under the local conditions of Balochistan. Effect of localities with respect to the environmental data was also explored. Overall average values for BWT ranged from 15 to 68 kg with an average of 30.12 ± 0.15, DIM were 180 to 728 with an average of 313.56 ± 3.83 and MY ranged from 1471 to 7033 lit with an average of 3731.26 ± 40.52. The effect of year, season, age and location were studied and the results revealed that the year (P<0.01) and season of birth (P<0.05) and location of the farm (P<0.01) had significant effect on BWT, while age of the dam had non-significant effect on this trait. In case of DIM and MY, season of calving and location of farm had non-significant effect while the effect of year of calving (P<0.01) and age of the dam (P<0.01) had significant effect on MY but no significant effect on DIM. Overall performance of these imported and farm born Holsteins was much better than the local breeds.
Keywords: Holsteins, production profile, Balochistan, Pakistan

INTRODUCTION

Milk production is one of the most efficient processes in converting plant material into a nearly perfect food "milk" for humans. According to a report (Anonymous, 1996) an allowance of 250 ml of milk covers a major part of the daily basic nutritional needs for a child. While per capita availability of milk has been reported as 169 kg per annum in Pakistan (Pakistan Economic Survey, 2007-08), which is far less than that of several advanced countries. The low productivity of our animals is mainly because of non-descript animals, which according to some estimates are 11752 thousand head all over the country (Khan et a;., 2008). In recent past, to meet the increasing demand of milk, the government encouraged the import of exotic breeds of dairy cattle in the country with the objective of either rearing as purebred or to be used for upgrading the indigenous non-descript cattle. Holstein-Friesian was the main dairy breed imported for this purpose.

There are several physiological and environmental factors which can affect the productive potential of these animals in tropical and sub-tropical environment but they still perform significantly well. These pure exotic dairy cattle were imported and maintained in the country to increase milk production, but these cattle have to be managed and maintained in a well-established scientific way to fully exploit their genetic potentials. The present project was, therefore, planned to investigate the productive performance of Holsteins imported from Denmark and kept at different Government dairy farms at seven locations in Balochistan province. This study provides a guideline for further import, breeding policy and keeping standards of such exotic breeds in the country.

MATERIALS AND METHODS

Data for the present study were collected from seven different Government dairy farms of Balochistan Province. These farms were located at Kalat (1), Khuzdar (2), Loralai (3), Mustung (4), Pishin (5), Quetta (6) and Zhob (7). The number of animals comprised more than 210 with 750 lactation records covering almost 18 years from 1977 to 1994.

The data were processed to study the productive performance of these imported Holsteins and their farm-born daughters kept under different managemental practices and climatic conditions of the province. To study the overall performance of these imported and farm-born cattle, the productive parameters included were birth weight of calves (BWT), days in milk (DIM) and milk yield (MY).

For determination of the effect of season on various parameters, the year was divided into four seasons winter (Dec-Feb), spring (Mar-May), summer (Jun-Aug), and autumn (Sep-Nov). The influence of various

environmental factors of the trait under study were determined. The mathematical model for determining the environmental factors on birth weight was as follows:

$Y_{ijklm} = \mu + Y_i + S_j + A_k + L_l + \mu_{ijklm}$

where: $i = 1,2,\ldots\ldots p$ (number of years = 13)

$j = 1,2,\ldots\ldots q$ (number of seasons = 4)

$k = 1,2,\ldots\ldots r$ (number of age groups of dams = 7)

$l = 1,2,\ldots\ldots s$ (number of locations = 7)

Y_{ijklm} = birth weight of mth calf at l^{th} location of kth dam age group born in j^{th} season of the ith year. μ = overall population mean

Y_i = effect of ith year of birth

S_j = effect of jth season of birth

A_k = effect of kth dam's age group

L_l = effect of lth location

μ_{ijklm} = random error associated with the birth weight of mth calf at l^{th} location of kth dam's age group born in j^{th} season of the ith year. It was further assumed that μ_{ijklm} was normally and independently distributed wth mean zero and variance (2.

Mathematical models for lactation length and milk yield were similar to model of birth weight except that year and season of birth were replaced with year and season of calving and age of the dam with age of the cow itself. As the data of different parameters represented unequal disappropriate sub-class frequencies and were thus analyzed by using Mixed Model Least Squares and Maximum Likelihood (Harvey, 1990) computer program.

RESULTS AND DISCUSSION

Overall performance values for birth weight (BWT), days in milk (DIM) and milk yield (MY) for Holsteins kept at different locations are presented in Table 1.

that there was a significant effect of the year of calving and location of farm (P<0.01) and season of birth (P<0.05) while the age of dam had non-significant effect on BWT (Table 2).

A wide variation was observed in the mean BWT during different years. The range being 26.88±1.55 kg in 1986 to 32.71±1.81 kg in 1978. There was no specific trend for this trait across the years but normally it remained about 29-30 kg in different years. Birth weights were higher (30.82±1.39 and 30.29±1.43 kg) among the calves born during winter and spring than those born in summer and autumn season (29.76±1.41 and 29.75±1.39 kg). Similar findings were reported by Ornelas et a;. (1981) who reported that spring born calves were heavier than autumn born calves of the imported cattle in the tropics. The results of this study were also in line with those of Boonprong et a;. (2008). They found that an average birth weight of Thai Brahman and Simental Brahman crossbred (Khabinburi) cattle were 28.5±0.32 and 32.16±0.55 respectively.

The variation in birth weight of calves observed during different years reflected the level of feeding and management as well as some environmental effects like rainfall, humidity and temperature, etc. on the cows during pregnancy. Availability of feed and fodder could never have been the same over the 18 years period due to rainfall and several other factors like provision of funds, quality and quantity of seeds and fertilizer, etc. which could have affected the productive performance of the animals in the different years. Heavier birth weight of calves born during winter and spring may be due to the availability of good quality fodder for cows during late pregnancy periods. The age of the dam did not exert any significant effect on birth weight of the newly born calf. It seems that the nutritional availability and health status of the cow is more important for

Table 1. Overall average values of various productive traits in Holsteins

Trait	No. of Obs.	Range	Mean ± SE
Birth weight (BWT)	695	15-68 d	30.12 ± 0.15
Days in milk (DIM)	395	180-728 d	313.56 ± 3.83
Milk yield (MY)	628	1471-7033 lit	3731.26 ± 40.52

The table clearly shows that the performance of Holsteins in all of three traits is much better than local breeds of cattle. The effect of different environmental factors on BWT, DIM and MY was determined and the results are discussed below.

Birth Weight

The effect of year and season of birth, location of the farm and the age of the dam on birth weights of calves were determined. The analysis of variance revealed

better birth weight as compared to the age of dam. Shin et a;. (1986) also reported that the age of the dam had no significant effect on the birth weight of the calves born.

The birth weight of calves was significantly (P<0.1) affected by the location of farm. The calves born at Quetta had the highest birth weight (32.25±1.52 kg), whereas the calves born at Khuzdar had the lowest birth weight (28.60±1.42 kg). This difference is mainly

Table 2. The levels of significance of the means squares and the residual mean squares for BWT, DIM and MY in Holsteins

SOV	BWT		DIM		MY	
	df	Sig	df	Sig	df	Sig
Year of birth	17	**	17	NS	17	**
Season of birth	3	*	3	NS	3	NS
Location of Farm	6	**	4	NS	6	NS
Age of the Dam	6	NS	5	NS	6	**
Residual	591	13.33	301	6859.45	521	984408.59

**Significant (P<0.01). *significant = (P<0.05). NS= non-significant

due to climatic conditions including altitude, rainfall/atmospheric pressure and feed/fodder availability at different locations. The temperature situation in Quetta is quite low which is highly favorable for maintaining Holsteins that are well-adapted to the cold environments. The difference of location exerted in our study was significant which is also in agreement with the results of Shin *et a;.* (1986) and Boonprong *et a;.* (2008).

The effect of age of the dam or lactation number on the BWT of calves is shown in Table 3. It also did not show any specific trend. Lactation number in this study had no effect on the birth weight of calves. Mean BWT was in the range of 29.20 to 30.88 kg during different lactations. Some Indian workers (Nair *et a;.* 1985) have reported the significant effect of age of the dam in imported cattle, but in this study no effect of lactation or age of the dam was observed.

The lactation length was 306.69±18.92, 335.57±20.48, 301.43±21.24 and 302.14±19.55 days in winter, spring, summer and autumn, respectively with no statistical difference among seasons. The values for DIM varied at different locations but no significant difference of the location of the farm was observed. Approximately similar lactation length was reported by Mondal et al (2005).

With the increase in age of the dams or lactation number, there was slight decline in the DIM but the difference was not significant within various age groups of the animals. The values for DIM in various lactations are presented in Table 3. Mean DIM were in the range of 304.47±7.82 to 320.20±6.74 d during different lactations.

Present results are similar to those of (Queiroz *et a;.* 1987) who reported no effect of season on lactation

Table 3. Least square means of BWT, DIM and MY during different lactations in Holsteins

Lactation No.	BWT		DIM		MY	
	No. of Obs.	Mean ± SE	No. of Obs.	Mean ± SE	No. of Obs.	Mean ± SE
1	212	30.88 ± 0.33	125	319.98 ± 6.83	203	3690.83 ± 77.40
2	182	30.86 ± 0.32	106	304.47 ± 7.82	174	3768.16 ± 84.65
3	163	29.93 ± 0.32	96	320.2± 6.74	150	3800.35 ± 89.48
4	108	29.69 ± 0.42	54	305.37 ± 11.21	88	3780.70 ± 113.41
5	28	30.36 ± 0.47	12	315.25±27.15	34	3740.33 ± 288.59
> 5	15	29.20 ± 1.41				

Days in milk

The effect of year and season of birth, location of the farm and age of the dam on DIM were determined. The analysis of variance revealed that none of these factors influenced the lactation length or DIM (Table 2). There was no statistical difference in lactation length due to year of calving. Lactation length was minimum (267.86±31.82 days) in 1985 and was maximum (397.01±36.36 days) during 1991.

length in Holsteins and crossbred cattle. Similar to our study are the results of Herrera Garcia (1976) who mentioned that the age of the cow had non-significant effect on days in milk.

Milk yield

The MY varied significantly (P<0.01) over different years of calving (Table 2). On yearly basis, the MY per lactation was minimum (2708.95±247.39 kg) in 1985 and maximum (4263.72±269.76 kg) was obtained in

1992. The values for MY among seasons were 3617.50±148.88, 3705.27±168.42, 3607.23±160.54 and 3615.07±151.78 kg for winter, spring, summer and autumn respectively. These results were in line with the Bashir et al (2005) who reported that year and season had significant effect on milk yield in Jersey cattle.

There was a significant (P<0.01) variation in the MY among different age groups and lactation numbers of the dams while a non-significant effect of the season of calving and location of farm was observed. The values of MY on the basis of age of the dam and lactation numbers are presented in Table 3. There was non-significant difference due to season on milk yield. Similar results have been reported by Kabuga and Agyemang (1984) who studied this trait in Holsteins cattle kept in humid forests of Ghana.

In this study, milk yield varied with the age of the animal. Maximum milk yield (3808.14±136.63 kg) was obtained at the age of 5-6 years while it was minimum (3465.64±115.18 kg) at the age of 3-4 years. Maximum production at the age of 5-6 years is mainly due to that the animal is at its prime of production while at the age of 3-4 years the animal is at the growing stage and its body and secretory tissues are not fully developed. The effect of age on milk yield was non-significant statistically. It is mainly due to incomplete data as the animals of later lactations were only 7 to 9 years old. Similar results were obtained by Suk et a;. (1984) who reported that age had non-significant effect on milk yield. Egyptian workers (Shehata at al. 1995), concluded that season of calving (autumn and winter) was the major factor affecting total milk yield. They analyzed the data of 381 lactations of 232 dairy cows maintained at Bany-Mor Dairy Farm, Assiut from 1990-94 and reported an average of 3908 kg total milk yield. They further suggested a negative relationship between production and reproductive efficiency of dairy cows.

Milk yield varied widely at different Government dairy farms at different locations of the province. The value was minimum (2540.82 ± 376.47 kg) for Kalat while it was maximum (4245.22 ± 238.05 kg) for Pishin. Milk yield at Khuzdar and Quetta was about the same as at Pishin (4005.07 ± 169.36 kg and 4028.31±221.39 kg, respectively). The higher ranges of production at Pishin, Khuzdar and Quetta indicated better management and feeding available to the animals. The animals at these places are more open to visitors and get more attention and supervision as compared to other locations. The role played by the administrative guidance and directions is also quite evident.

CONCLUSIONS

Imported Holsteins kept in Balochistan at all seven locations are doing well as far as their production performance is concerned. They were placed in this province because the environment in these areas is cool humid and temperate. By augmenting the efficient and targeted managemental practice, increasing the levels of interest and commitment and better record keeping, much better results can be expected. Sudden changes of managemental staff also affect yields. Farm born animals should be given the same level of feeding, management and regular culling as envisaged for imported ones.

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