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INFLUENCE OF GENETIC AND ENVIRONMENTAL FACTORS ON LACTATION PERFORMANCE OF HOLSTEIN FRIESIAN CATTLE IN BALOCHISTAN

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ABSTRACT

Data on 100 Holstein-Friesian cows for a period of 15 years (1988-2002) were analyzed using least squares and maximum likelihood methods. Lactation components such as lactation length, peak yield, milk yield and age at calving averaged 319±56, 474±42 liters, 3661±785 liters, 1963±636 days respectively. The h^2 estimates were 0.49, 0.29, 0.32 and 0.535 for these parameters, respectively. Seasonal analysis revealed that there was no influence of calving season on lactation components. Summer, Autumn, Winter and Spring had lactation length 323±50, 317±49, 313±56 and 321±55 days, monthly peak yield 477±77, 472±70, 466±53 and 482±73 kg, and milk yield 3685±766, 3593±817, 3645±677, 3724±864 kg., respectively.

Key words: Genetics, environment, lactation performance, Friesian, Balochistan.

INTRODUCTION

In Pakistan, total milk production is 46.4 million kg from 35.6 million cattle and 31.7 million buffaloes (GOP, 2011). Although, it stands among the major milk producing countries of the world, yet this yield is horizontal rather than vertical. The low productivity per head has many reasons; lack of genetically improved dairy cattle, late age at maturity, longer calving intervals, mal-nutrition and inadequate artificial insemination services are among the main causes.

Pakistan is bestowed with best buffalo breeds, however, Balochistan province lacks native dairy cattle and buffalos; hence shortage of milk is a serious problem due to low productivity per animal in existing draught cattle breeds (Anonymous, 2005). In order to overcome the deficiency of milk in the province Balochistan; a high yielding strain of Holstein-Friesian was imported from Denmark for self-sufficiency in milk production in the province. Holstein-Friesian breed was introduced with a presumption that it can thrive and perform well under the prevailing climatic conditions of the province and maintain higher production level. Consequently, in 1977-78, 175 pregnant heifers and 2 breeding bulls of Holstein-Friesian (Black and White) breed were imported from Denmark and stationed at Government Dairy Farm, Quetta. A study was therefore planned to know the influence of genetic and environmental factors on lactation components and production performance of Holstein Friesian cattle in Balochistan.

MATERIALS AND METHODS

The data for the present study were collected from Government Dairy Farm Quetta for the period of fifteen years to know the effect of genetic and environmental factors on lactation components in Holstein Friesian cattle. Government Dairy Farm, Quetta is one of the modern dairy farms in Pakistan, where the cows are milked through milking machines. All milking machines and farm utensils are washed with commonly used disinfectants before and after milking. The cows are milked twice daily at 2.00 am and 2.00 pm. The automatic drinking cups are installed in every shed. All the animals are drenched twice in a year for the control of all kinds of internal parasites. In summer, animals and premises of the farm are sprayed for the control of external parasites. All the animals are vaccinated according to the schedule against various bacterial and viral diseases. Intensive system of feeding is practiced on the farm. The artificial insemination system of breeding is being practiced on the farm. The pure Holstein-Friesian semen is imported from other countries like U.S.A, Holand and Germany. The data were collected on 100 cows having at least five lactations. The genetic factors i.e., age at calving, sire effect and cow within sire effect while non genetic parameter i.e., season of calving and lactation components i.e., lactation length, peak yield and total milk yield (305 days) were recorded. To assess the effect of season of calving on the different productive traits, a year was divided into four winter, spring, summer and autumn seasons. Range of temperature in winter (November, December and January) was 11°C to -15°C. Spring season (February, March and April) has average temperature from 5°C to 23°C. In summer (May, June

and July) temperature range from 24°C to 39°C while, autumn season (August, September and October) has average temperature from 11°C to 34 °C. The data collected for a period of 15 years for different production traits were subjected to statistical analyses by using Least Square Analysis Technique using LSMLMW program (Harvey, 1990).

RESULTS AND DISCUSSION

The average values for productive traits of Holstein Friesian cattle are given in Table 1. Our findings are in line to earlier literature (Juma and Al-Tikriti, 1990; Reddy *et al.* 1991) where average lactation length is reported from 320 to 325 days. Tomar and Pandey (1995) also reported least-squares means of peak yield in Tharparker and its F1 crossess with exotic breeds for all lactations were 10.6±0.4, 21.0±0.9, 16.3±0.6 and 18.6±0.5 kg . Ali *et al.* (1996) reported the highest peak yield in 3rd lactation (43.08 kg) while, 4th lactation had the lowest peak yield (24.00 kg). Milk yield is well comparable to Teotia *et al*. (1990) who reported 3023.1 ± 48.2 liters from 225 Sahiwal x Friesian cows in India. Afridi (1996) and Baloch (1997) have also reported similar results for milk yield. The average age at calving fall in the range reported in earlier literature (Roy *et al.* 2001; Pelister *et al*. 2000). Ding and Kayaba (2001) calculated heritability 0.14 and 0.38 for milk yield and age at first calving respectively, while Moll *et al*. (1992) reported heritability 0.26, 0.22 and 0.59 for milk yield, peak yield and lactation length, respectively.

The daughters of sire Nigir gave highest milk yield and peak yield as compared to the daughter of other sires (Table 2). The average milk yield and peak yield of daughters of sire Nigir was significantly different ($P<0.05$) from the daughters of sires Vitalis, Minister. Whereas, the lactation length and age at calving of daughters of Nigir were significantly different from the observed averages of the daughters of Vitalis, Main-548 and Minister. These averages are in agreement with Bahdauria *et al* (2002) and Jadhav *et al.* (1994) who reported significant sire effects on lactation length, peak yield, milk yield and age at calving, respectively.

The seasonal effects on lactation components i.e., lactation length, peak yield and milk yield are given in Table 3 which showed that season of calving had no influence on lactation components. Our results are similar to Rako and Karadjole (1995) who reported average lactation length of 364.7, 351.5, 352.6 and 354.3 days during spring, summer, autumn and winter seasons, respectively. In contrary to our study, Bhadoria, *et al*. (2002) reported that season of calving significantly ($P<0.01$) affected peak yield and higher peak yield was in summer and rainy season. These differences in results may be due to different climate of both the region.

Table 1: Mean values and heritability (h^2) estimates of various productive traits of Holstein-Friesian cattle.

Traits	Mean Values ± S.D	Heritability (h^2)
Lactation length (days)	319 ± 56	0.49
Peak yield (kg) (Month-wise)	474 ± 42	0.29
Milk yield (kg)	3661 ±785	0.32
Age at calving (days)	1963 ± 636	0.53

Table 2: Sire effect on various productive traits of Holstein-Friesian cattle

Sire	Lactation length (days)	Peak yield (liters)	Milk yield (liters)	Age at calving (days)
Cocco	324^{ab}± 52	407^{b} ± 74	3735^{ab}± 648	2018^{ab}±617
Nigir	334^{a} ± 62	491^{a} ± 68	3912^{a}± 755	2165^{a}± 689
Vitalis	316^{bc}± 52	464^{ab}±77	3538^{bc}±715	1832^{b}± 596
Main 548	316^{bc}± 57	474^{ab}± 69	3729^{ab}± 942	1910^{b}± 599
Minister	306^{c} ± 52	455^{ab}±76	3391^{c}±742	1888^{b}± 631

Mean with different superscripts within column are significantly different at $P<0.05$

Table 3: Seasonal effect on various productive traits of Holstein-Friesian cattle

Seasons	Lactation length (days)	Peak yield (liters)	Milk yield (liters)
Summer	323 ± 60	477 ± 77	3685 ± 766
Autumn	317 ± 49	472 ± 70	3593 ± 817
Winter	313 ± 56	466 ± 63	3645 ± 677
Spring	321 ± 55	482 ±73	3724 ± 864

Conclusion: The existing production of the herd is comparatively low than the genetic potential of the breed which may be due to ill-management and haphazard breeding practices. There was significant sire effect which indicates the possibility for improving the existing stock through selective breeding.

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