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Performance Analysis of Holstein-Friesian Cattle in Intensive Management at Dairy Farm Quetta, Balochistan, Pakistan

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Abstract

The present study was performed to estimate the productive and reproductive performance of Holstein-Friesian cattle. The data on calving (n=600) obtained from cattle (n=100) for lactations (1-6) during last ten years (1997-2006) were analyzed. The herd kept under intensive management at Government Dairy Farm Quetta, Balochistan, Pakistan. Overall means of the Milk Yield (MY) for 1st, 2nd, 3rd, 4th, 5th and 6th lactations were 3848.00±15.77, 4303.70±32.79, 4431.40±41.65, 4186.30±49.59, 3767.61±35.38 and 3329.53±28.01 liters, respectively with an overall average of 3977.75±37.20 liters. Birth weight of female and male were observed as 35.65±0.51 and 39.74±0.46 kg, respectively. The results revealed that lactation length (LL), age at maturity (AM), age at first conception (AFCc), age at first calving, (AFC), services per conception (SPC), service period (SP) as days, calving interval (CI) as), and Dry period (DP) 314.19±0.91, 625.40±14.65, as 655.10±10.44, as 894.74±13.11, 2.80 ± 0.10, 129.95±2.14, 408.09±2.10, (87.06±1.63 days). The results of all traits showed variation, however, MY, BW, SP, CI and DP parameters were only significantly dissimilar (P<0.05). Season of calving possessed varying affect on MY, LL, BW and SP on the performance of the Holstein-Friesian cattle herd. It is concluded that productive and reproductive performance of Holstein-Friesian cattle in the present study were low to modest so it is required to improve managemental practices at the farm for better productive and reproductive performance.

Key words: Holstein-Friesian cattle, Lactation length, Dry period, Productive and reproductive traits

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The most important role of livestock is the production of high quality animal protein for human consumption through the supply of milk and meat. Milk production is the most efficient process in converting plant material into a perfect food. Milk constitutes an integral part of our daily diet necessary for nourishment and health development of the human being (Irshad et al., 2011). Pakistan is gifted with a large livestock population. The national herd consists of 33.0 cattle, 29.9 buffaloes, 27.4 sheep, and 58.3 goats in million. Productivity of animals in Pakistan is generally low and need to improve (GOP, 2010). Main reasons of low productivity of farm animals are; non-descript breed, poor management, lack of nutrition, lack of resources, low inputs; inadequate artificial insemination service and diseases. These causes leads to low average milk production, late age of first calving, delayed conception, impaired fertility, long calving intervals (Khan et al., 2008; Ali et al., 2011)

Balochistan, which is the main province of the Pakistan, has diverse geographical features, climatic variation, social and cultural background. Scattered human population, vast infertile land, dearth of water for irrigation and human consumption, and low rain fall are feature of the area which contributes towards low economical growth (Kakar and Ahmad, 2004). Lesser population of cattle and buffalo in comparison to sheep and goat coupled with lesser milk yield has resulted in acute shortage of milk and other milk product in the province (GOP, 2010).

In recent years, to meet the increasing demand of milk, the government expectant the import of exotic breeds of dairy cattle in the country with the intention of either rearing as purebred or 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 significantly influence the productive potential of these animals in tropical and sub-tropical environment. These imported exotic dairy cattle are maintained in order to get increased milk production. Holstein-Friesian has genetic potential to produce

high milk production in Balochistan (Bilal et al. 2005). However, even it is over 30 years to raise this breed, self capability in milk production in the province are yet not to be achieved (Afzal and Naqvi, 2004).

To overcome the shortage of milk, Livestock and Dairy Development Department, Government of Balochistan decided in 1977-78, to import Holstein-Friesian cattle. For this purpose, 175 pregnant heifers and 2 bulls were imported from Denmark and stationed at Government dairy farm, Quetta. The study was aimed at multiplying the breed and raising it under different environmental/climatic conditions in different parts of the Balochistan province. The present study was, therefore, planned to assess and compare the productive and reproductive performance of Holsteins-Friesian cattle kept at Government Dairy Farm Quetta, in Balochistan province.

Materials and Methods

In order to investigate the productive and reproductive performance of Holstein-Friesian under intensive management system, the records of calving (n=600) obtained from cattle Holstein-Friesian (n=100) for the lactations (1-6) period kept at the Government Dairy Farm Quetta Balochistan, Pakistan were analyzed for the period of 10 years (1997 to 2006). The traits included milk yield lactation (MY), Birth weight (BW), age at maturity (AM), age at first conception (AFCc), age at first calving, (AFC), services per conception (SPC), service period (SP), calving interval (CI), lactation length (LL), dry period (DP). To evaluate the effect of season of calving on different traits of the herd, therefore months of the year were grouped in four seasons (winter, summer spring and autumn). Intensive system of feeding is practiced on farm. Most commonly available green fodders were sorghum, Lucerne, corn, and berseem. During the scarcity of fodder, animals were fed dry roughages (wheat straw, corn). The artificial insemination breeding system was practiced on the farm. The arithmetic means, with standard error (± SE), for the above mentioned reproductive and productive parameters were calculated. Statistical analysis was done using analysis of variance technique and significant results were subjected to Duncan's multiple range tests (Steel and Torrie, 1984).

Results and Discussion

Milk yield lactation (MY): The results of MY of Holstein-Friesian for six lactations (n=600) are presented in Table 1. MY averaged was observed as 3848.00±15.77, 4303.70±32.79, 4431.40±41.65, 4186.30±49.59, 3767.61±35.38 and 3329.53±28.01 liters, in 1st, 2nd, 3rd, 4th, 5th and 6th lactations respectively, with an overall mean of 3977.75±37.20 liters. It was determined that the highest MY achieved in the 3rd lactation with 4431.40±41.65 liters while the lowest MY was observed in the 6th lactation as 3329.53±28.01 liters. The results of ANOVA revealed that there were highly significant differences between and among lactations; further data showed that there was significant effect of seasons on MY ($P<0.05$). The lactation MY obtained in spring was higher than those obtained in winter, summer and autumn.

The results of the present study were consistent with the findings of some researchers (Sandana and Basu, 1981; Cheema, 1985) who reported that the MY in Holstein-Friesian cattle ranged from 3911 to 5259 kg. Irshad et al. (2011) also reported averaged MY (3992.41±16.20 liters) for Holstein-Friesian cattle at Pishin Pakistan.

The MY for the present study was higher than those reported by many researchers (Oliveria, 1975; Parmar and Dev, 1978; Osman and Kassim, 1983). These researchers reported that MY of Holstein-Friesian cows in different part of world averaged 2554 kg in Brazil; 3144.2±45.7 kg in India; 3139.49±56 kg in Pakistan and 1917 kg in Malaysia respectively. Higher MY of Holstein-Friesian cattle were also reported by Gual (1982), who obtained milk yield averages of 6202; 6576; 6439 and 4328 kg, respectively from Bejco, Northern Mexico, Hidalgo and Publa farms. These differences might be due to breeds strain, differences in parities, length of lactation, herd, climatic and management conditions.

Lactation length (LL): The results of LL for 600 reports in Holstein-Friesian cattle are presented in Table 1. The estimates of the LL of the present study were in agreement with the result of the several investigators as Perez and Ronda (1983) reported the average LL as 315±17.9 days in India. Dabduab and Misra (1988) reported an average LL of 303.2 days for purebred Friesians in Iraq, and Juma et al. (1990) found that 273 Holstein-Friesian during 1978-1987 recorded mean LL of 320 days. The higher LL compared to present study was accepted by Oliveria (1975) who found it 392 days for Holstein-Friesian in Brazil, and Basu (1974) also reported LL 347.42±5.59, whereas several authors have reported lesser LL than the averaged LL in the present study as Taj (2001) reported 265 days LL at Punjgoor, Pakistan, and Sattar et al. (2005) observed 291.86±6.55 days LL in Holstein-Friesian at Patoki, Pakistan. Irshad et al. (2011) documented average LL for 600 reports in Holstein-Friesian cattle at Pishin, Pakistan was found as 320.14±11.14 days with the range of 299.6.±13.64 to 356.93±12.50 days. There

Table 1: Productive and Reproductive Traits of Holstein-Friesian cattle (n=100 cattle each lactation) Farm Quetta (Means±SE)

Lactation #	Milk yield (liters)	Lactation length (days)	Dry period (days)	Calving interval (days)
1	3848.00±15.77	319.68±0.94	85.47±1.60	405.15±2.23
2	4303.70±32.79	323.28±0.81	88.07±1.67	411.35±2.05
3	4431.40±41.65	325.91±1.04	89.40±1.60	415.31±2.28
4	4186.30±49.59	322.11±0.75	87.04±1.61	409.15±1.90
5	3767.61±35.38	314.17±0.83	85.33±1.68	399.50±2.05
6	3329.53±28.01	280.04.±1.09	86.73±1.62	410.41±2.12
OA*	3977.75±37.20	314.19±0.91	87.06±1.63	408.09±2.10

OA* = Over all average

Table 2: Productive and Reproductive Traits of Holstein-Friesian Cattle (n=100 cattle each lactation) Farm Quetta (Means±SE)

Lactation #	Female Birth Weight (kg)	Male Birth Weight (kg)	Age at Maturity (days)	Service Period (days)
1	35.11±0.39	39.62±0.56	655.30±11.12	126.98±2.25
2	35.19±0.55	39.78±0.42	623.54±13.17	133.51±2.05
3	35.20±0.41	40.17±0.55	610.22±15.76	136.92±2.33
4	36.96±0.77	39.42±0.37	599.10±15.76	131.13±1.91
5	35.28±0.50	39.62±0.51	620.55±14.06	121.23±2.14
6	36.17±0.45	40.02±0.34	627.32±13.54	127.43±1.56
OA*	35.65±0.51	39.74±0.46	625.40±14.65	129.95±2.14

OA* = Over all average

are many factors which are responsible for varying values of LL trait such as number of lactation, age of cow, plane of nutrition, environmental and management system (Sattar et al., 2005).

Birth weight (BW): The BW of male (n=311) and female (n=274) calves as 39.74±0.46 and 35.65.10±0.51 kg respectively (Table 2). Lower BW of male and female of calves as compared to the present study was reported by many researchers (Becker et al., 1995; Baloch, 1997; Jaffar, 2000 and Taj, 2001). These differences might be due to breed, environmental and managerial practices that had impact on BW.

Calving Frequencies: It is noted that the higher calving months in the summer (26.17%) followed by autumn (25.17%), spring 25.00%) and winter 23.66%).

Age at maturity (AM): The results of AM of heifers were presented in table 2. Similar findings were observed by many researchers as Chaudhry and Ahmad (1994) who recorded in crossbred heifers, Sattar et al. (2005) also reported the average age at maturity in 236 heifers 652.10 ± 6.98 days, ranging from 356 to 1077 days in Pakistan and Irshad et al. (2011) documented AM in Holstein-Friesian heifers was 650.10±5.67 days, ranging from 373 to 1065 days. Higher age at maturity (987.22 ± 14.77 days) for Bhagnari heifers in Pakistan was reported by Azam et al. (2001). On the other hand, lower values (18.3 months) were also reported by Ozbeyaz et al. (1996) in Swiss Brown heifers. These differences might be due to environmental and managerial practices that had impact on age of maturity.

Age at first conception (AFCc): The mean estimate for AFCc of Holstein-Friesian heifers was 655.10±10.44 days, (ranging from 439 to 996 days). Cheema (1985), Sheikh (1997), Juma et al. (1990), Rafique et al. (2000) reported similar estimates (ranged from 618 to 632 days) in crossbred heifers in Pakistan and Ali et al. (2011) observed this value in Holstein-Friesian heifers was 633.82 ± 10.44 days, ranging from 339 to 1031 days. Higher age at first conception as compared to the present study was reported by Chaudhry and Ahmad (1994) in crossbred heifers and Sattar et al. (2005) in Holstein-Friesian (828.5 ± 233.1 and 714±9.72 days) respectively, in Pakistan. On the other hand, Haq et al. (1993) recorded lower age at first conception (502.93 ± 11.71 days) in Holstein-Friesian heifers in Pakistan. These differences might be due to location and variable management practices at different farms. Feeding and breeding decisions might also have affected this trait.

Age at first calving (AFC): The average age at first calving for Holstein-Friesian heifers was

894.74±13.11 days, ranging between 810 - 1287 days. These findings were in agreement with those recorded by Gual (1982) who observed (852 ± 43.8) days at first calving in Holstein-Friesian heifers, Njubi et al. (1992) reported in Jersey heifers in Kenya, Shiekh (1997) also documented 907.77 days and Irshad et al. (2011) found in Holstein-Friesian heifers was 912±13.11 days. Higher age at first calving (1237, 1017 ± 43.8 and 987±8.81 days) was found by Morsy et al. (1986), Mangeraker et al. (1995) and Sattar et al. (2005) in Friesian heifers, respectively. On the other hand, Juneja et al. (1991) and Haq et al. (1993) reported lesser age at first calving in Friesian heifers (822 and 787 days, respectively). These differences might be due to differences in management and herds.

Number of services per conception (SPC): The average number of SPS for the present study was observed as 2.80 ± 0.10. Almost similar findings 3.10 services per conception were recorded by Saha and Parekh (1988) in crossbred cows in India and Sattar et al. (2005) reported (3.07±0.10) in Friesian cows in Patoiki, Pakistan, Irshad et al. (2011) also testimony for 2.89 ± 0.10 in Friesian cows However, Mangurkar et al. (1987) and Garcia and Velez (1988) reported to be lower (1.50 and 1.80) number of services per conception in Friesian cows. Variations in the management, environment and fertility status of the breeding cows might lead to differences in number of services per conception.

Service period (SP): The average SP of Holstein-Friesian cows for the present study was 129.95±2.14 days (Table 2), varying from 34.0 to 387 days. The results of ANOVA revealed that differences in SP between calving number were highly significant as well as between lactation (2^{nd} and 5^{th}), (3^{rd} and 5^{th}), (1^{st} and 3^{rd}) and (4^{th} and 5^{th}). Further it was observed that season has significant effect on SP. Similarly, Juneja et al. (1991), Juma et al. (1990), Haq et al. (1993) reported the service period as 156, 145.5 and 161 days, respectively in Friesian cows and Irshad et al. (2011) reported in Holstein-Friesian cows was 133.797±5.84 days.. However, Gogoi et al. (1993) observed much longer service period (280 days) in Jersey cows in India. Mustafa et al. (2003) reported longer (235.87 ± 14.05days) service period in Red Sindhi heifers in Pakistan, and Sattar et al. (2005) reported that average service period for 508 records in Holstein-Friesian cows was 222.22±6.87 days, ranging from 46 to 828 days. Less days service period mean early gestation period and more life with prime milk yield Service period differed due to differences in feeding and breeding management (Irshad et al., 2011).

Calving interval (CI): The average CI was 408.09±2.10 days (Table 1. The maximum CI was achieved in 3rd CI (415.31±2.28 days), while the least CI was found (399.50±2.05days) in the 5^{th} calving. In the present study, significant difference in calving interval between lactation and season ($P<0.05$) were establish. Further records showed that there were high significant difference ($P<0.05$) between lactation (2^{nd} and 5^{th}), (3^{rd} and 5^{th}), (1^{st} and 3^{rd}) and (4^{th} and 5^{th}). Juma et al. (1990), Juneja et al. (1991) and Irshad et al. (2011) recorded almost similar standards (418, 414.17 and 409.17±7.32 days, respectively) in Friesian cows. However, Morsy et al. (1986) and Sattar et al. (2005) and Younas et al. (2008) reported longer calving interval in Friesian cows as compare to present study. (522±39.9, 505.02±8.28 and 451.1 0±5.55 days respectively) These differences might be due differences in herds, management and feeding regimes.

Dry period (DP): The average DP for Holstein-Friesian cows (n=500) was 87.06±1.63 days (Table 1**),** with a range of 45-159 days and difference between lactations was noted in the present study. However, season has non significant effect on DP. Similar average dry period result was reported by Irshad et al. (2011) on Holstein-Friesian cows i.e. 102.18±15.35 days. Longer average dry period compared to the present study was observed by Gogoi et al. (1993) who reported 233.5 days DP in Jersey cows, Juneja et al. (1991) and Sattar et al. (2005) reported a DP of 224.99 ± 10.00 days in Jersey and Friesian cows in India and Pakistan, respectively. Shorter average DP compared to the present study was observed by Younas et al. (2008) as 59.15±20.16 day in Holstein-Friesian cows. These differences might due to herd, feeding and breeding management. The results of the present study revealed that cows calved during spring season had longest service period. Sattar et al. (2005) justified that may be these cows had their breeding period during hot months. The tendency of oestrus to be silent and short in hot season makes detection of heat difficult. Heat stress might have resulted in reduced reproductive efficiency (in terms of ovulation, repeat breeding, conception rate etc.). This may be attributed to increased service period. Confining breeding of cows to the months of December, January and February (cooler months of the year) will help improve this trait. The average DP in the present study was lower than other studies because animals were not well fed and bred earlier. Longer DP has adverse effects on profitability of the enterprise therefore effort should make to achieve the goal of relatively shorter dry period for improved profitability of farm (Irshad et al., 2011).

Conclusion

The results of all traits showed disparity however, services per conception, service period, gestation

period parameters were only significantly different ($P<0.05$). The diversity in productive and reproductive traits detected during different years reflected the level of feeding and management in addition to some environmental effects like rainfall, humidity and temperature (season) on the cows. Availability of feed and fodder could never have been the same over the 10 years period due to rainfall and several other factors like stipulation of funds, quality and quantity of seeds and fertilizer, etc, which could have affected the productive performance of the animals in the different years. Conclusively, results indicated productive and reproductive traits of Holstein-Friesian cattle were low to moderate when compared to the previous reports. To harvest the better results in reproductive efficiency of Holstein cows in an exotic environment, proper care and management, efficient insemination techniques are necessary to let these animals enjoy an enhanced productive life to exhibit their genetic potentials. Proper management of the animals through various phases of life from birth to maturity will ensure their early age of service and maturity, better conceivability and a lower calving interval. Therefore, it was necessary to improve managerial practices at the farm for providing superior reproductive and productive traits of the farm. This study would provide an instruction for further import, breeding policy and keeping principles of such exotic breeds in the country.

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