

STUDIES ON THE REPRODUCTIVE EFFICIENCY OF BHAGNARI CATTLE IN BALUCHISTAN

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ABSTRACT

In this study, various parameters of reproductive efficiency of Bhagnari cattle in Pakistan were investigated. For this purpose, data on reproductive performance records of 223 Bhagnari cows maintained at the Government Cattle Farm, Usta Muhammad, Baluchistan from 1975 to 1985, were analyzed. The results showed that the age at puberty for 223 Bhagnari heifers averaged 987.22 ± 14.77 days, the range was 524 to 1827 days. In 73.09% cows the age at puberty ranged between 701 and 1200 days. The winter born heifers showed significantly lower age at puberty than those born in other seasons. The average age at first calving was 1293.6 ± 18.28 days, the range being 763-2150 days. A total of 63.23% cows gave the birth to their first calf between 1101 and 1600 days of age. Among 798 conceptions, 28.45, 51.75 and 14.28% occurred by 1, 2 and 3 services, respectively, with an average conception rate of 48.22%. The average service period for 520 records was 156.48 ± 14.3 days, the range being 25-671 days. Cows calving in summer showed the longest service period, while winter calvers showed the shortest service period, the difference was significant ($p < 0.05$). The average gestation period for 801 gestations was 284.4 ± 0.7 days. The average length of calving interval for 487 observations was 450.12 ± 5.8 days, the range being 290-783 days. Cows calving in summer showed longer ($p < 0.05$) calving interval than those calving in other seasons. The average reproductive efficiency of Bhagnari cows was $68.80 \pm 0.98\%$, the range was 30.59-98.91%.

Key Words: Bhagnari cattle, reproductive efficiency, Baluchistan.

INTRODUCTION

Reproductive efficiency is a measure of net profitability and economic value of a dairy animal. It is the most important factor determining the success of livestock production. Differences in the reproductive efficiency of an individual are largely due to nutrition and environment, although breed and heredity also play a part. The age at first calving and calving interval are the most important parameters of the reproductive efficiency of a dairy cow. These parameters depend greatly on the age at puberty, number of services required per conception and the post-partum oestrus interval.

Apart from their draft qualities, the Bhagnari cattle seem to have good potential for beef production. It has been estimated that about 0.5 million heads of Bhagnari cattle are found in the plains of Sibi, Kacchi and Nasirabad districts of the Baluchistan province of Pakistan. In the past, some work has been reported on the reproductive efficiency of Sahiwal cows (Rehman, 1979) and Nili-Ravi buffaloes (Ahmad *et al.*, 1983) in Pakistan. However, the potential for the reproductive efficiency of Bhagnari cattle maintained under the climatic conditions of Baluchistan have not been thoroughly studied.

The present study was, therefore designed to examine various parameters of reproductive efficiency of

Bhagnari cows maintained at the Government Cattle Farm, Usta Muhammad, Baluchistan. Seasons of the year have been shown to influence various parameters of reproductive efficiency in Sahiwal (Tayyab and Qureshi, 1967), Ongole (Rao *et al.*, 1969) and Harayana cattle (Dhillon *et al.*, 1970). Recently, Rafique *et al.* (2000) observed that season of birth of a calf had a significant ($p < 0.05$) effect on its age at maturity in Holstein Friesian X Sahiwal crossbreds. The female calves born during spring season had lower maturity age than those born in other seasons. Thus, in the present study, attempts were made to investigate possible effects of seasons of the year on the reproductive efficiency of these cows.

It is hoped that the results of this study will go a long way in chalking out future plans for the improvement of the productive and reproductive performance of Bhagnari cows in Baluchistan. This, in turn, will be very useful for the increase of beef production in the country.

MATERIALS AND METHODS

For this study, the data on reproductive performance records of 223 Bhagnari cows and heifers, maintained at the Government Livestock Farm, Usta Muhammad, Baluchistan, during the period of 10 years from 1975 to

1985 were used. Information regarding date of birth, date of first service, date of fruitful service and date of calving were taken from the history sheets of each animal. From the available information, the following parameters of reproductive efficiency were computed:

(i) Age at puberty, (ii) age at first calving, (iii) conception rates, (iv) service period, (v) gestation period, (vi) calving interval and (vii) per cent reproductive efficiency.

Age at puberty was calculated in days from the date of birth of a female to the date of first observed oestrus. For oestrus detection, heifers were regularly observed in the morning and the evening in the presence of a vasectomized teaser bull. Age at first calving was computed in days from the date of birth of a heifer to its date of first calving. Animals which aborted at any stage of gestation were not included in analysis and the data of 223 heifers were available.

Conception rates were calculated for various number of services required for conception. Service period was defined as the period, in days, from the date of calving to the date of subsequent conception. The records of 520 service periods were available for study. The interval between the date of conception of a female and the date of subsequent normal calving was taken as the gestation period. The data on 801 gestation periods could be obtained. The period between two consecutive normal calvings was taken as the calving interval, and the records of 487 calving intervals were included in the analysis.

The per cent reproductive efficiency of the Bhagnari cows was calculated according to the following formula reported by Succi and Roy-Choudhury (1969):

Reproductive efficiency = $365(n-1) D \times 100$, where

n = total number of calvings and

D = total number of days from the first to the last calving. The data on 173 cows with at least two calving intervals were used to work out the reproductive efficiency.

The arithmetic means, with standard errors, for various parameters of reproductive efficiency were calculated. The data were also analyzed to investigate the possible effects of season of birth of a calf on its age at puberty. Similarly, the effects of season of calving on the length of subsequent service period and calving interval were investigated. In order to see the magnitude of variation in these parameters among various groups studied, the data were subjected to statistical analysis using analysis of variance technique (Steel and Torrie, 1980). Duncan's multiple range test (Duncan, 1955) was applied for multiple mean comparisons, where necessary.

RESULTS AND DISCUSSION

Age at puberty

In the present study, the age at puberty for 223 Bhagnari heifers averaged 987.22 ± 14.77 days, the range

was 524 to 1827 days. In 73.09% cows the age at puberty ranged between 701 and 1200 days. The age at puberty of upto 700 days was recorded in 10.32% cows while in only 2.24% females this age was beyond 1500 days (Table 1).

According to Cheema and Khan (1971), the average age at maturity in 500 Sahiwal heifers at Bahadurnagar farm was 809 days, while Ishaq and Shah (1975) observed the average maturity age of 812 days for 864 Sahiwal heifers at the same farm. For Cholistani, Red Sindhi, Tharparkar and Harayana breeds of cattle, the age at maturity averaged 609.67 ± 31.9 (Chaudhry *et al.*, 1983), 753 ± 20.7 (Bhosrekar, 1976), 789 ± 11.7 (Bhosrekar, 1976) and 1404 (Singh *et al.*, 1968) days, respectively. Besides genetic variations, differences in the nutritional status and management practices can be responsible for these discrepancies.

The winter born heifers showed significantly lower age at puberty ($p < 0.05$) than those born in autumn, summer or spring (Table 3). However, the differences in the age at puberty among heifers born in the latter three seasons were non significant.

Rafique *et al.* (2000) observed that season of birth of a calf had a significant ($p < 0.05$) effect on its age at maturity in Holstein Friesian X Sahiwal crossbreds. The female calves born during spring season had lower maturity age than those born in other seasons. In the present study, winter born heifers matured earlier than those born in other seasons. It appears that winter born heifers grow enough during spring before they are exposed to adverse climatic conditions of summer, when the availability of green fodder is also low. Moreover, decline in serum thyroxine levels during summer can depress feed intake and metabolism, affecting the general body growth of the animal.

Age at first calving

The average age at first calving in 223 Bhagnari cows was 1293.6 ± 18.28 days, the range being 763-2150 days. In 22.87% cows the age at first calving was less than 1100 days, while 63.23% cows gave birth to their first calf between 1101 and 1600 days of age. In only 13.90% cows, the age at first calving was beyond 1600 days (Table 1).

The average age at first calving of 1224, 1260 and 1230 days in Sahiwal cattle reported by Yasin and Wahid (1952), Mahadevan (1958) and Batra and Desai (1964) are in close agreement with the present findings. Higher age at first calving, 1470 days, has been reported for Sahiwal heifers (Ahmad, 1972).

For optimum reproductive performance under climatic conditions of Pakistan, a heifer should attain maturity at an approximate age of two years and deliver the first calf by three years (about 1100 days) of age. In

this study 22.87% cows showed age at first calving of less than 1100 days. It shows that there is great potential for the reduction of age at first calving in Bhagnari females. This can be achieved by reducing age at maturity through selective breeding, improved nutrition and better management at the farm (Rafique *et al.*, 2000).

Conception rates

In this study, 1655 matings were recorded which resulted in 798 conceptions, showing an average conception rate of 48.22%. When the data were split according to the number of services required for conception, it was noted that 28.45, 51.75 and 14.28% conceptions occurred by 1, 2 and 3 services, respectively. Only for 5.52% conceptions, more than three services were required.

For optimum reproductive performance, a female should conceive at the first service. In the present study, only 28.45% conceptions occurred with one service while 19.80% conceptions occurred with three or more services. Attempts should be made to investigate the cause(s) of conception failure in such females.

well prepared to bear the burden of next gestation. In this study, only 38.46% animals showed the service period of less than 100 days. This parameter has a very low heritability and is largely influenced by non genetic factors including management. Thus, to achieve the desired goal of achieving one calf each year, attempts should be made to improve the management practices at the farm e.g. heat detection measures, protection against adverse climatic conditions and adequate feed supply.

When the data on service periods were classified according to the season of calving, cows calving in summer showed the longest service period, while winter calvers showed the shortest service period (Table 3). Further analysis of the data revealed that summer calvers differed significantly from winter and spring calvers and non significantly from autumn calvers.

Gestation period

In the present study, the average gestation period for 801 gestations in Bhagnari cows was 284.4 ± 0.7 days. Frequency distribution of the data revealed that the length of 4.11% gestations was between 250 and 270 days, for

Table 1: Frequency distribution for age at puberty and age at first calving in Bhagnari cows.

Age at puberty (days)			Age at first calving (days)		
Age groups	No. of animals	Frequency (%)	Age groups	No. of animals	Frequency (%)
501-600	9	4.04	701-800	2	0.90
601-700	14	6.28	801-900	10	4.48
701-800	29	13.00	901-1000	16	7.18
801-900	34	15.25	1001-1100	23	10.31
901-1000	38	17.04	1101-1200	31	13.90
1001-1100	38	17.04	1201-1300	32	14.35
1101-1200	24	10.76	1301-1400	35	15.70
1201-1300	14	6.28	1401-1500	24	10.76
1301-1400	14	6.28	1501-1600	19	8.52
1401-1500	4	1.79	1601-1700	11	4.94
Above 1500	5	2.24	Above 1700	20	8.96
Total	223	100.00	Total	223	100.00

Service period

In the present study, the average service period for 520 records was 156.48 ± 14.3 days, the range being 25-671 days. In 38.46% animals the service period was up to 100 days, in 54.43% cows it was between 101 and 300 days while in the remaining 7.11% animals it was more than 300 days (Table 2).

The average service period of various Indian cattle breeds recorded by Bhasin (1967), Dutt *et al.* (1974) and Sharma and Bhatnagar (1975) ranged between 144 and 174 days, which coincide with the findings of the present study. A service period of 60-90 days is considered most desirable for achieving the ideal of one calf each year. It also allows sufficient rest period for lactating animals by providing an optimum interval of sexual rest during which uterine involution is completed and the female is

94.37% it was between 271 and 290 days while in the remaining 1.52% it was more than 291 days.

Gestation period is more or less a constant parameter of reproductive efficiency which is genetically determined for a species. Bhalla *et al.* (1968) reported that for 51 calvings in Sahiwal cows, the gestation period averaged 282 days, with a range of 268 to 295 days, which is in line with the present observations.

Calving interval

The average length of calving interval for 487 observations was 450.12 ± 5.8 days, the range being 290-783 days. In 36.96% cows, the length of calving interval was between 290 and 400 days, in 57.70% it was between 401 and 600 days, while in the remaining 5.34% animals it was between 601 and 783 days (Table 2).

Average calving interval of 439 and 444 days for Sahiwal cattle, as reported by Kushwaha (1965) and Gehlon and Malik (1967), are in close agreement to the present observations. Similarly, an average calving interval of 454 days for Harayana (Bhasin, 1967) and 456 day for Tharparker cattle (Dutt *et al.*, 1974) support the present findings.

86.78% it was between 51 and 90% while in the remaining 4.60% animals it was between 90 and 99%. The values of reproductive efficiency of 84.3% in Sahiwal cows (Bhatnagar and Sharma (1967) and 85.72% in Tharparker cows (Dutt *et al.*, 1974) are higher than those recorded for Bhagnari cattle in the present study. Besides differences in the genetic make up of the animal,

Table 2: Frequency distribution for service period and calving interval in Bhagnari cows.

Service period (days)			Calving interval (days)		
Groups	No. of animals	Frequency (%)	Groups	No. of animals	Frequency (%)
Upto 50	34	6.54	Upto 300	4	0.82
51-100	166	31.92	301-400	176	36.14
101-200	171	32.89	401-500	175	35.93
201-300	112	21.54	501-600	106	21.77
301-400	32	6.15	601-700	22	4.52
Above 400	5	0.96	Above 700	4	0.82
Total	520	100.00	Total	487	100.00

Table 3: Effect of season of calving on the age at puberty, length of subsequent service period and calving interval in Bhagnari cows.

Season of birth/ calving	Age at puberty (days)	Service period (days)	Calving interval (days)
Spring	903.2a	154.4a	444.2a
Summer	892.7a	167.1a	468.2b
Autumn	890.6a	161.6a	446.4a
Winter	862.3b	142.8b	442.2a
Average	987.22 ± 14.77	156.48 ± 14.3	450.21 ± 5.8

Values with different subscripts within a column differ significantly ($p < 0.05$).

Schindler *et al.* (1976) concluded that the calving interval not exceeding 365 days is ideal for obtaining maximum reproductive efficiency in dairy cattle. In the present study, 36.96% cows showed the calving interval of less than 400 days. These animals seem to be the same which showed the service period of less than 100 days. Thus, to reduce the calving interval, a reduction in the length of service period seems important.

In the present study, cows calving in summer showed significantly longer ($p < 0.05$) calving interval than those calving in spring, autumn or winter seasons (Table 3). The differences in the length of calving interval among cows calving in the latter three seasons were, however, non significant. Tayyab and Qureshi (1967), Rao *et al.* (1969) and Dhillon *et al.* (1970) also observed significant effect of season of calving on the length of subsequent calving interval in cattle. Long calving interval in summer calvers could be due to the fact that in summer the reproductive performance of the cattle is influenced directly by climatic stress and indirectly by impaired feed supply, as well as body metabolism.

Percent reproductive efficiency

In the present study, the average reproductive efficiency of Bhagnari cows was $68.80 \pm 0.98\%$, the range was 30.59-98.91%. In 8.62% cows, the reproductive efficiency was between 30 and 50%, in

nutritional, managemental and environmental factors can be responsible for these variations.

Based on the results of the present study, it may be concluded that suitable measures should be taken to reduce the age at first calving and the length of calving interval in order to improve the reproductive efficiency of Bhagnari cattle in the country.

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