

## REPRODUCTIVE EFFICIENCY OF JERSEY COWS UNDER SUBTROPICAL CONDITIONS OF THE PUNJAB

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### ABSTRACT

Various parameters of reproductive efficiency of Jersey cows kept at the Livestock Experiment Station, Bhunikey (Pattoki), District Kasur, for the period from 1991 to 2000 were studied. The average values of age at maturity and age at first calving were  $615.48 \pm 8.23$  and  $926.48 \pm 10.29$  days, respectively and the differences of these parameters during different seasons of birth were statistically non-significant. The average calving to first insemination interval, service period and calving interval were  $86.65 \pm 1.71$ ,  $152.66 \pm 4.85$  and  $430.15 \pm 4.87$  days, respectively. The differences of calving to first insemination interval among cows calved during different seasons were statistically non-significant. But the differences of calving to first insemination interval during 1<sup>st</sup> lactation were significant ( $P < 0.05$ ) with those of 6<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> lactations. Service period and calving interval in the Jersey cows calved during humid hot season were significantly ( $P < 0.05$ ) shorter as compared to those of cows calved during dry hot and spring seasons. Effect of parity on the service period was non-significant, but the effect of parity on the calving interval was significant ( $P < 0.05$ ), when the difference of calving interval during 7<sup>th</sup> and 8<sup>th</sup> lactation was compared. The average number of services per conception was  $2.81 \pm 0.09$ . The effect of parity on the number of services per conception was significant ( $P < 0.05$ ). The average gestation period was  $277.63 \pm 0.21$  days. Higher gestation period was observed in cows carrying male calves than those carrying female calves ( $P < 0.05$ ). The frequency of calvings during winter, spring, dry hot, humid hot and autumn seasons was 19.32, 19.20, 9.79, 33.25 and 18.44 percent, respectively.

**Key words:** Reproductive efficiency, Jersey cows, Pakistan.

### INTRODUCTION

The Government of the Punjab imported a herd of 100 Jersey cows from USA during November, 1985, for producing the bulls of high genetic potential to ensure regular and adequate supply of good quality semen for crossbreeding of low yielding non-descript cattle. Various parameters of reproductive performance in imported Jersey cows and their local born progenies have been studied for the period from 1985 to 1991 (Haq *et al.*, 1993).

The present study was designed to evaluate various parameters of reproductive performance in Jersey cows maintained at the Livestock Experiment Station, Bhunikey (Pattoki), District Kasur, for the period from 1991 to 2000. The information thus obtained would enable us to know the adaptability of Jersey breed under local conditions of Pakistan.

### MATERIALS AND METHODS

Data concerning reproductive performance of Jersey cows maintained at the Livestock Experiment

Station, Bhunikey (Pattoki) District Kasur for the period from 1991 to 2000 were collected. Various parameters of the reproductive efficiency including age at maturity, age at first calving, services per conception, calving to first insemination interval, service period, gestation period, calving interval and frequency of calving were studied. The data on age at maturity and age at first calving were split according to season of birth, while data on calving to first insemination interval, service period and calving interval were grouped according to season of calving. Similarly, the possible effects of parity on number of services per conception, calving to first insemination interval, service period and calving interval were also studied.

To determine the effect of season of birth or calving on various parameters, the months of the year were grouped into following five seasons, as described by Thevamanoharan *et al.* (2001):

Winter	December and January
Spring	February, March and April
Dry hot summer	May and June
Humid hot summer	July, August and September
Autumn	October and November

The arithmetic means with standard error (mean  $\pm$  SE) for the above mentioned parameters were calculated. In order to see the magnitude of variation in these parameters among different groups, the data were subjected to statistical analysis using analysis of variance technique (Steel and Torrie, 1984) and significant results were subjected to Duncan's multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

### Age at maturity

The average age at maturity in 306 Jersey heifers was  $615.48 \pm 8.23$  days, ranging from 372 to 1434 days. Similar findings were reported by Rafique *et al.* (2000) and Qureshi *et al.* (2002) in crossbred heifers in Pakistan. Higher age at maturity ( $1024.86 \pm 27.54$  days) was reported in Red Sindhi heifers in Pakistan by Mustafa *et al.* (2003).

When the data were grouped according to the season of birth, the highest ( $628.22 \pm 12.29$  days) and the lowest ( $586.57 \pm 26.43$  days) ages at maturity were observed in heifers born during humid hot and dry hot seasons, respectively (Table 1), the difference was non-significant. Similarly, Rafique *et al.* (2000) reported that the effect of season of birth on age at maturity in crossbred heifers in Pakistan was non-significant. On the other hand, Azam *et al.* (2001) reported significantly lower age at maturity in winter born Bhagnari heifers than those born in other seasons in Pakistan.

### Age at first calving

The average age at first calving in 269 Jersey heifers was  $926.48 \pm 10.29$  days, ranging from 651 to 1842 days. Similar findings were reported by Njubi *et al.* (1992) in Jersey heifers in Kenya. Higher age at first calving, 970 and 1347 days, was reported by Qureshi *et al.* (2002) and Mustafa *et al.* (2003) in crossbred and Red Sindhi heifers in Pakistan, respectively. Haq *et al.* (1993) reported lower (772 days) age at first calving in Jersey heifers.

In the present study, when the data were grouped to observe the effect of season of birth on age at first calving, the longest ( $955.57 \pm 17.94$  days) and the shortest ( $896.80 \pm 23.84$  days) ages at first calving were observed in Jersey heifers born during humid hot and winter seasons, respectively (Table 1), the difference was statistically non-significant. Similarly, Haq *et al.* (1993) and Rafique *et al.* (2000a) reported non-significant effect of season of birth on age at first calving in Jersey and crossbred heifers in Pakistan, respectively.

### Calving to first insemination interval

The average calving to first insemination interval for 657 records was  $86.65 \pm 1.71$  days, ranging from 46 to 377 days. Rafique *et al.* (2000a) reported almost similar findings in crossbred cows in Pakistan. When the data were grouped to observe the effect of calving season on subsequent calving to first insemination interval, the longest ( $89.22 \pm 4.24$  days) and the shortest ( $83.71 \pm 4.82$  days) intervals were observed in cows calved during autumn and dry hot seasons, respectively (Table 1), the difference was non-significant. Similarly,

**Table 1: Effect of season of birth and calving on subsequent reproductive traits in Jersey cows (mean  $\pm$  SE)**

Seasons	Effect of birth season		Effect of calving season		
	Age at maturity (days)	Age at first calving (days)	Calving to first insemination period (days)	Service period (days)	Calving interval (days)
Winter	$586.80 \pm 20.48^a$ (51)	$896.80 \pm 23.84^a$ (46)	$87.87 \pm 4.14^a$ (117)	$155.71 \pm 13.04^{ab}$ (77)	$434.57 \pm 12.89^{ab}$ (77)
Spring	$627.19 \pm 21.13^a$ (70)	$905.27 \pm 24.27^a$ (49)	$89.20 \pm 4.50^a$ (117)	$172.12 \pm 11.78^a$ (78)	$449.60 \pm 11.80^a$ (78)
Dry hot	$586.57 \pm 26.43^a$ (23)	$907.50 \pm 28.30^a$ (20)	$83.71 \pm 4.82^a$ (65)	$179.34 \pm 13.77^a$ (50)	$456.88 \pm 13.75^a$ (50)
Humid hot	$628.22 \pm 12.29^a$ (92)	$955.57 \pm 17.94^a$ (92)	$84.02 \pm 2.56^a$ (225)	$136.50 \pm 7.79^b$ (159)	$412.90 \pm 7.89^b$ (159)
Autumn	$617.43 \pm 16.98^a$ (70)	$928.21 \pm 22.58^a$ (62)	$89.22 \pm 4.24^a$ (133)	$146.83 \pm 10.70^{ab}$ (89)	$425.10 \pm 10.69^{ab}$ (89)

Values with different superscripts in the same column differ significantly ( $P < 0.05$ ) and values sharing at least one superscript in a column differ non-significantly.

Number of available records is given in parenthesis.

the longest ( $105.73 \pm 12.79$  days) and the shortest ( $69.00 \pm 5.39$  days) calving to first insemination intervals were observed in cows during 1<sup>st</sup> and 9<sup>th</sup> lactation, respectively (Table 2). The differences of 1<sup>st</sup> lactation with those of 6<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> lactations were significant ( $P < 0.05$ ). Rafique *et al.* (2000a) reported significant effect of parity on calving to first insemination interval in crossbred cows in Pakistan.

### Services per conception

The average number of services per conception for 828 records in Jersey cows was  $2.81 \pm 0.09$ , ranging from 1 to 24. Haq *et al.* (1993) reported lesser average number of services per conception (1.83) in Jersey cows in Pakistan. When the data were grouped to observe the effect of parity, the highest ( $3.72 \pm 0.47$ ) and the lowest ( $1.75 \pm 0.08$ ) number of services per conception were observed during 6<sup>th</sup> and 1<sup>st</sup> lactation, respectively (Table 2). The differences of services per conception during 6<sup>th</sup> lactation with those of 1<sup>st</sup>, 4<sup>th</sup>, 7<sup>th</sup> and 9<sup>th</sup> and the differences of 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup> and 8<sup>th</sup> lactations with that of 1<sup>st</sup> lactation were significant ( $P < 0.05$ ). Ozbeyaz *et al.* (1996) reported that number of services per conception increased with age and parity in cows.

### Service period

For 453 observations, the average service period in Jersey cows was  $152.66 \pm 4.85$  days, ranging from 46 to 606 days. Murdia and Tripathi (1992) reported almost similar findings in Jersey cows in India. However, Javed *et al.* (2000) reported longer service period ( $233.51 \pm 7.61$  days) in Sahiwal cows in Pakistan. Similarly, Juneja *et al.* (1991) and Gogoi *et al.* (1993) also reported longer service period (179 and 280 days) in Jersey cows in India. On the other hand, Haq *et al.* (1993) reported shorter service period (101 days) in Jersey cows in Pakistan.

When the data were grouped according to calving season, the longest ( $179.34 \pm 13.77$  days) and shortest ( $136.50 \pm 7.79$  days) service periods were observed in cows calved during dry hot and humid hot seasons, respectively (Table 1). The service period in Jersey cows calved during humid hot season was significantly ( $P < 0.05$ ) shorter than that of cows calved during dry hot and spring season. Similarly, Azam *et al.* (2001) reported that Bhagnari cows calving in summer showed the longest service period and the winter calver cows showed the shortest service period in Baluchistan province of Pakistan.

Similarly, when the data were grouped according to parity, the longest ( $176.46 \pm 33.09$  days) and the

**Table 2: Effect of parity on different reproductive parameters in Jersey cows (mean  $\pm$  SE)**

Lactation No.	Calving to first insemination period (days)	Services per conception (No.)	Service period (days)	Calving Interval (days)
1	$105.73 \pm 12.79^a$ (15)	$1.75 \pm 0.08^e$ (269)	$143.40 \pm 12.33^a$ (20)	$425.05 \pm 12.89^{ab}$ (19)
2	$83.80 \pm 3.07^{ab}$ (163)	$3.01 \pm 0.17^{abcd}$ (208)	$160.77 \pm 9.23^a$ (148)	$438.07 \pm 9.22^{ab}$ (148)
3	$81.39 \pm 3.36^{ab}$ (109)	$2.96 \pm 0.21^{abcd}$ (145)	$155.78 \pm 11.23^a$ (103)	$432.65 \pm 11.24^{ab}$ (104)
4	$82.46 \pm 4.36^{ab}$ (74)	$2.55 \pm 0.22^{bcde}$ (84)	$148.12 \pm 10.96^a$ (65)	$425.12 \pm 10.91^{ab}$ (65)
5	$83.16 \pm 4.65^{ab}$ (50)	$2.89 \pm 0.43^{abcd}$ (63)	$140.69 \pm 13.21^a$ (48)	$417.90 \pm 13.26^{ab}$ (48)
6	$79.19 \pm 7.11^b$ (36)	$3.72 \pm 0.47^a$ (47)	$161.48 \pm 19.62^a$ (31)	$440.06 \pm 19.50^{ab}$ (31)
7	$79.39 \pm 7.81^b$ (18)	$2.41 \pm 0.27^c$ (39)	$108.81 \pm 13.74^a$ (16)	$386.00 \pm 13.91^b$ (16)
8	$92.40 \pm 16.95^{ab}$ (15)	$3.00 \pm 0.53^{abcd}$ (22)	$176.46 \pm 33.09^a$ (13)	$454.92 \pm 33.07^a$ (13)
9	$69.00 \pm 5.39^b$ (10)	$2.10 \pm 0.75^d$ (10)	$113.78 \pm 34.75^a$ (9)	$392.11 \pm 35.82^{ab}$ (9)

Values with different superscripts in the same column differ significantly ( $P < 0.05$ ) and values sharing at least one superscript in a same column differ non-significantly.

Number of available records is given in parenthesis.

shortest ( $108.81 \pm 13.74$  days) service periods were observed in cows during 8<sup>th</sup> and 7<sup>th</sup> lactation, respectively (Table 2), the difference was statistically non-significant.

### Gestation period

The average gestation period for 797 records in Jersey cows was  $277.63 \pm 0.21$  days, ranging from 261 to 297 days. Haq *et al.* (1993) and Mustafa *et al.* (2003) reported longer gestation period ( $279.26 \pm 0.51$  and  $283.15 \pm 0.64$  days) in Jersey and Red Sindhi cows in Pakistan. But Rathi *et al.* (1992) reported shorter gestation period (276.5 days) in crossbred (Jersey x Sahiwal) cows in India. Significantly ( $P < 0.05$ ) longer gestation period was observed in Jersey cows carrying male calves than cows carrying female calves ( $279.82 \pm 0.34$  versus  $278.43 \pm 0.36$  days). These findings are in line with those reported by Haq *et al.* (1993) in Jersey cows in Pakistan. Longer gestation period in cows carrying male calves may be due to the reason that more time is required to gain higher birth weight in male calves. The frequencies of calving during winter, spring, dry hot, humid hot and autumn seasons in Jersey cows were 19.32, 19.20, 9.79, 33.25 and 18.44%, respectively.

### Calving interval

For 453 records, the average calving interval in Jersey cows was  $430.15 \pm 4.87$  days, ranging from 319 to 878 days. Deshmukh *et al.* (1992) and Rafique *et al.* (2000a) reported almost similar findings in Jersey and crossbred cows in India and Pakistan, respectively. But Gogoi *et al.* (1993) reported longer calving interval (540 days) in Jersey cows in India. Haq *et al.* (1993) and Qureshi *et al.* (2002) reported shorter (381 and 390 days) calving interval in Jersey and crossbred cows in Pakistan.

When the data were grouped according to calving season, the longest ( $456.88 \pm 13.75$  days) and the shortest ( $412.90 \pm 7.89$  days) calving intervals were observed in Jersey cows calved during dry hot and humid hot seasons, respectively (Table 1). The calving interval in Jersey cows calved during humid hot season was significantly ( $P < 0.05$ ) shorter than that of cows calved during dry hot and spring seasons. Similarly, Haq *et al.* (1993) and Azam *et al.* (2001) reported that the cows calving in summer showed longer calving interval than other seasons. However, Jahageerda *et al.* (1996) reported non-significant effect of calving season on calving interval in Holstein-Friesian cows.

When the data were grouped according to parity, the longest ( $454.92 \pm 33.07$  days) and shortest ( $386.00 \pm 13.91$  days) calving intervals were observed in Jersey cows during 8<sup>th</sup> and 7<sup>th</sup> lactation, respectively (Table 2).

The differences of calving interval during 8<sup>th</sup> and 7<sup>th</sup> lactations were found statistically significant ( $P < 0.05$ ). Similarly, Rafique *et al.* (2000a) reported significant effect of parity on calving interval in crossbred cows.

The variations in different reproductive parameters of this study with those reported by other workers might be due to differences in the breed, management, environment and fertility status of the breeding cows. The normal breeding season of Jersey cows starts just after the humid hot season and maximum conceptions occur during autumn and consequently the service period and calving interval remained significantly ( $P < 0.05$ ) lower for the cows calved during humid hot season.

The present study was conducted for the period from 1991 to 2000 at Livestock Experiment Station, Bhunikey (Pattoki), while Haq *et al.* (1993) conducted a similar study on the same Jersey herd for the period from 1985 to 1991. It is evident from the results of both the studies that the reproductive performance of Jersey herd at Livestock Experiment Station, Bhunikey is declining gradually. This indicates that managerial practices at the farm need to be improved for better reproductive performance of the herd.

### Acknowledgements

Acknowledgements are due to Dr. Khalid Javed for his valuable technical assistance in the analysis of data and Mr. Muhammad Ramzan for his help during the project.

### REFERENCES

- Azam, M., R.A. Chaudhry, N. Ahmad and I.H. Khan, 2001. Studies on the reproductive efficiency of Bhagnari cattle in Baluchistan. *Pakistan Vet. J.*, 21(1): 1-5
- Deshmukh, B.V., P.G. Sakhare and K.S. Deshpande, 1992. Factors affecting service period and calving interval of Jersey cows. *Indian J. Dairy Sci.*, 45: 388-389
- Duncan, D.B., 1955. Multiple range and multiple F test. *Biometrics*, 11: 1-42
- Gogoi, D.N., R.N. Goswami and D. Das, 1993. First lactation performance of Jersey, Red Sindhi and their F1 crosses under the farm condition of Assam. *Indian J. Anim. Sci.*, 63(5): 569-572
- Haq, A.U., R.A. Chaudhry, T. Rahil, N. Ahmad and R. A. Jabbar, 1993. Reproductive efficiency of Holstein Friesian and Jersey cows maintained at Livestock Experiment Station, Bhunikey (Pattoki), Punjab. Annual Report, Research Institute for Physiology of Animal Reproduction, Bhunikey (Pattoki), Distt. Kasur, pp: 24-34.

- Jahageerdar, S., M.G. Govindaiah, M.R. Jayashankar, G.R. Lokanath and H.S. Krishanaswamy, 1996. Effect of non-genetic factors on inter calving period of Holstein Friesians in tropical conditions. *Indian J. Dairy Sci.*, 49(8): 525-529.
- Javed, K., G. Mohiuddin and M. Abdullah, 2000. Some environmental effects on reproductive traits in Sahiwal cattle. *J. Anim. Plant Sci.*, 10(4): 109-112.
- Juneja, I.J., N.S.R. Sastry and B.L. Yadav, 1991. Performance of purebred herd of Jersey and Holstein-Friesian cows in the semi-arid region. *Indian J. Anim. Prod. Manag.*, 7: 240-241
- Murdia, C.K. and V.N. Tripathi, 1992. Effect of farm, period, season and parity on performance traits of Jersey cattle. *Indian J. Anim. Sci.*, 62: 177-180
- Mustafa, M.I., M. Latif, M.K. Bashir and B. Ahmad, 2003. Reproductive performance of Red Sindhi cattle under hot and humid environment of Balochistan province of Pakistan. *Pakistan Vet. J.*, 23(2): 66-72
- Njubi, D., J. Rege, W. Thorpe, E. Collins-Lusweti and R. Nyambaka, 1992. Genetic and environmental variations in reproductive and lactational performance of the Jersey cattle in the coastal lowland semi-humid tropics. *Tropical Anim. Hlth. Prod.*, 24: 231-241
- Qureshi, M.S., J.M. Khan, I.H. Khan, R.A. Chaudhry, K. Ashraf and B.D. Khan, 2002. Improvement in economic traits of local cattle through cross-breeding with Holstein-Friesian semen. *Pakistan Vet. J.*, 22(1): 21-26
- Rafique, M., K.R. Chohan and Q.Z. Chaudhry, 2000. Factors affecting age at maturity and age at first conception in Holstein-Friesian x Sahiwal crossbreds. *Pakistan Vet. J.*, 20(1): 40-42.
- Rafique, M., M.Z. Chaudhry and M.A. Amer, 2000a. Reproductive performance of inter se Holstein Friesian x Sahiwal crossbreds. *Pakistan Vet. J.*, 20(3): 109-112
- Rathi, R.C. R. Sharma, V. Singh and S.C. Tripathi, 1992. Genetic studies of reproductive traits in Sahiwal and its crossbreds. *Intern. J. Anim. Sci.*, 7(1): 93-95
- Steel, R.D.G. and J.H. Torrie, 1984. Principles and Procedures of Statistics. Mc-Graw Hill, Book Co. Inc. New York, USA.
- Thevamanoharan, K., W. Vandepitte, M.A. Khan, G. Mohiuddin and K. Javed, 2001. Non-genetic factors affecting various reproduction traits of Nili-Ravi buffaloes. *J. Anim. Plant Sci.*, 11(3): 83-88