REPRODUCTIVE PERFORMANCE OF NILI-RAVI BUFFALOES IN AZAD KASHMIR, PAKISTAN

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ABSTRACT

A total of 376 Performance records of 109 Nili-Ravi buffaloes maintained at Livestock Development Research Centre, Raroo, Muzaffarabad, Azad Kashmir, during 1989-2003 were utilized for the evaluation of some non-genetic factors affecting age at first calving, post partum oestrus interval, service period and calving interval. The Least squares means for age at first calving, post-partum oestrus interval, service period, and calving interval were 1644.87±36.31 days, 157.4±22.03 days, 208.35±24.03 days and 473.72±3.56 days respectively. A non-significant effect of season of birth on age at first calving was observed, while the effect of year of birth on age at first calving was significant (P<0.01). Post-partum oestrus interval was found to be significantly (P<0.01) influenced by season and year of calving, while a non-significant effect of both season and year of calving was observed on service period and calving interval. Parity had a significant (P<0.01) effect on post-partum oestrus interval and calving interval, while a non-significant effect of parity was observed on service period during the study.

Key words: Nili-Ravi buffaloes, Azad Kashmir, reproductive performance

INTRODUCTION

Nili-Ravi buffalo which is also called "Black gold" (Khan, 1986) occupies a key position in the agricultural economy of Pakistan. Their home tract canal irrigated areas of central Punjab (Shah, 1991), where they flourish due to abundant green fodder and water. In Azad Kashmir, there has been heavy influx of Nili-Ravi buffaloes during the last 3-4 decades and these buffaloes have gained much importance in the farming community due to general acceptance of buffalo milk, better butter fat contents, more milk yield and ability to use roughages more efficiently than cows.

The productive and reproductive performance of Nili-Ravi buffaloes have been extensively studied in Pakistan, (Ashfaq and Mason, 1954; Cady *et al*., 1983; Khan, 1986; Rehman, 1986; Shah, 1991; Thevamanoharan, 2002), but all these studies have been carried out mostly in canal irrigated areas of Punjab and no report is available about the reproductive performance of buffaloes in hilly areas of Pakistan particularly Azad Kashmir. Therefore there is a need for exploring the performance of Nili-Ravi buffaloes outside its home tract, especially in Azad Kashmir, where environment is totally different from central Punjab. This study was therefore designed to study reproductive performance of Nili-Ravi buffaloes in this part of the country.

MATERIALS AND METHODS

A total of 376 breeding and performance records of 109 buffaloes, maintained at Livestock Development Research Centre (LDRC) Raroo, Muzaffarabad Azad Jammu and Kashmir over a period of 15 years, from 1986-2003 were used for the present investigation.

Livestock Development Research Centre Raroo is mainly rain-fed. The average monthly rainfall is 300 mm in summer and 66 mm in winter. The climate is humid with hot summer having a monthly ambient temperature of 40 to 44^{0C} and cold winter with and the minimum temperature of three to $2^{o}C$ with occasional snowfall in upper reaches. There is shortage of green fodder during the months of November-December and May–June. During these months, animals are usually fed on wheat straw and fodder trees.

Since the establishment of this Centre, the female stock was mainly purchased based on body conformation paying attention to the phenotypic dairy characteristics only. Buffaloes were purchased mainly from Punjab from time to time, but for the last nine years, Centre has been able to produce its own replacements.

The animals are maintained in roofed sheds, which protect them from extremes of both hot and cold weather. Buffalo whether dry, pregnant or in milk are kept in one shed. The young ones of different age groups are kept in different sheds; males are kept separate from females. The calves are being weaned after 3-4 months after their birth but due to the strong mothering instinct of buffaloes, they are kept tied in front of their mothers while milking. Milking is carried out twice daily at 3:00 AM and 3:00 PM. The animals are stall-fed and no open grazing is being practised. Heifers and dry buffaloes were mainly kept on green fodder and other roughages

throughout the year except during the green fodder shortage periods when these are fed on wheat straw, fodder trees, and concentrates. Animals in late pregnancy and those lactating are fed green fodder ad-lib and concentrates @ of one Kg for maintenance and 0.5 Kg for every 1.5 Kg of milk.

The composition of feed varied according to the fodder crops available during the year. Maize (Zea mays) and mott grass were fed from July to October. From November to December, fodder trees like Iple iple were fed with wheat straw and some concentrates. From January to April Berseem (Trifolium alexendrium), Lucerne (Medicago sativa), and oats were fed to the animals. Dry fodder mainly comprised of wheat straw and hay. The concentrate mixture consisted of cotton seed cake, oats, and wheat bran. Lumps of common salt (sodium chloride) were provided in mangers with urea molasses blocks for free choice licking.

The data consisted of buffalo, service sire and calf identities, date of birth, date of service, date of calving, date of drying, date of disposal and lactation milk yield. Derived variables included age at first calving, post partum oestrus interval, service period, and calving interval.

In addition to the basic edits of consistency checks for dates and animal identities, records of buffaloes, which had aborted, missed a year due to sickness or other reasons were eliminated. The lactation period of up to 180 days and higher was included in this study. The lactation period of less than 180 days was excluded from the data. Age at calving was computed from birth and calving dates, and all buffaloes with obviously unacceptable ages were eliminated. During the study period buffaloes were either inseminated artificially or natural mating was practised after the heat detection aided by teaser bulls.

A spreadsheet, MS Excel ® was used for data entry and manipulation.

Effect of the environmental factors viz year and season of birth /service/calving and lactation number, as appropriate, on various performance traits was evaluated. Keeping in view the climatologically data the year was divided into following five seasons:-

Winter	December to January
Spring	February to April
Dry hot	May to June
Humid hot	July to September
Autumn	October to December.

The mathematical model assumed was-

$$Y_{ij} = \mu + F_i + e_{ij}$$

Where

Yij = measurement of a particular trait.

μ = Population mean.

Fi = the effect of all fixed effects with the restriction that $\sum Fi=0$.

eij = the random error associated with each observation.

For analysis Mixed Model Least Square Maximum Likelihood (LSMLMW) computer programme (Harvey, 1990) was used.

RESULTS AND DISCUSSIONS

The least squares means for age at first calving, post partum oestrus interval, service period and calving interval are presented in Table 1.

The least squares mean for age at first calving was found to be 1644.87±36.31days, which compares favourably with the findings of Javaid and Ahmad, (1969) who reported that age at first calving was 1669 days in Nili-Ravi buffaloes. A higher age at first calving (1726 days) was reported by Cady *et al*., (1983) in Nili-Ravi buffaloes in Pakistan. Some workers (Ashfaq and Mason 1954; Rehman, 1986; Khan *et al*., 1990; Thevamanoharan, 2002) reported shorter age at first calving ranging from 1431 to 1517 days in Nili-Ravi buffaloes in Pakistan.

The age at first calving is an important factor contributing to the milk production in dairy animals. The age at first calving determines the attainment of physical and sexual maturity. Sexual maturity has immense economic importance in dairy animal breeding programs. Economically, early first calving will ensure smaller investment and quicker return of capital. Genetically, it reduces the generation interval resulting in a better annual genetic gain from selection.

The analysis of variance revealed non-significant effect of season of birth on age at first calving, which was in accordance with the findings of Chaudhary *et al*., (1995) in Nili-Ravi buffaloes, while the findings of present study were not in line with the findings of Cady *et al*., (1983) and Thevamanoharan, (2002) who reported a significant effect of season of birth on age at first calving in different breeds of buffaloes.

The analysis of variance revealed significant effect of year of birth on age at first calving, which was in agreement with the findings of (Khan, 1986; Thevamanoharan, 2002). Khan, (1986) reported that age at first calving among the Nili-Ravi buffaloes calving during different years showed wide variation. It varied from 42 to 62 months; the year of calving had a significant effect on age at first calving, while Saha *et al*., (2000) reported a non-significant effect of year of birth on age at first calving in Murrah and Bhadawari buffaloes in India.

The least squares mean for post partum oestrus interval in Nili-Ravi herd in the present study was 157.43±22.03 days, which was in accordance with the findings of (Rao *et al*., 1973; El-Fouly *et al*., 1977 and Rehman, 1986). Rehman, (1986) reported a post partum oestrus interval of 181 days in Nili-Ravi buffaloes, however Cady *et al*., (1983) reported a post partum

oestrus interval of 190 days in Nili-Ravi buffaloes. A shorter post partum oestrus interval of 79±45.4 days was reported by Asghar *et al*., (1985) in Nili-Ravi buffaloes in Pakistan.

Year of calving had a significant effect on post partum oestrus interval, which was further substantiated by the findings of Rehman, (1986) who reported that post partum oestrus interval in Nili-Ravi buffaloes during different years differed significantly from each other. Buffaloes calving during different years also showed a marked fluctuation in post partum oestrus interval in the present study. This seems to be pure managemental problem more than anything else. With reasonable use of records and measures of heat detection, combined with other better managemental practices post partum oestrus interval could be shortened.

Analysis of variance revealed highly significant effect ($P<0.01$) of season of calving on the trait. The present findings were in agreement with the findings of Rehman, (1986); Khan, (2002); Ingawale and Dhoble, (2004).

Buffaloes calving during normal (humid hot) calving season had the shortest post-partum oestrus interval, this could be attributed to the effect of ambient temperature along with shortening of day length, since the sexual activity in buffaloes is said to be adversely affected by increase in temperature as well as day length (Majeed *et al*., 1966). Buffaloes calving during winter are normally expected to exhibit post partum oestrus in summer, which is characterized by high environmental temperature, maximum day length. As such, most of the buffaloes do not come in heat during summer resulting in longer post-partum oestrus interval than humid hot or autumn. Buffaloes calving during summer or autumn, show post-partum oestrus in the following autumn or winter when the temperature and day length are declining. This results in shorter post partum oestrus interval in buffaloes calving during humid hot or autumn seasons. The winter calvers are normally expected to show first post-partum oestrus during spring when temperature and day length are increasing, therefore the winter calvers exhibit longer post-partum oestrus interval. Thus it may be concluded that buffaloes calving during normal season (humid hot to autumn) show significantly shorter post-partum oestrus interval then those calving outside the normal season (winter, spring and dry hot).

The effect of parity on post-partum oestrus interval in Nili-Ravi buffaloes was significant in the present study. There was marked fluctuation in post-partum oestrus interval in Nili-buffaloes in their different parities. This may be attributed to managemental practices and the calving season of the buffaloes, as is seen from the least squares means for post-partum oestrus interval in the table below, the number of buffaloes in first and second parities was highest as compared to other parities therefore there is every possibility of buffaloes calving in the autumn and winter season when the post-partum oestrus interval is shortest.

The least squares mean for service period in Nili-Ravi herd in the present study was 208.35±24.03 days. The service period in buffaloes is generally reported to be very long because of various causes like silent heat, an-ovulalory heat, seasonal ovarian inactivity, embryonic mortality and infertile services etc. The estimates of service period in the present findings were in agreement with findings of Rehman, (1986) and Thevamanoharan, (2002) who reported service periods of 217.03, and 198.69 days, respectively in Nili-Ravi buffaloes. The findings of present study were not in line with the findings of Shafique and Usmani, (1996) and Jain and Tailor, (1994), who reported shorter service periods of 176 and 155 days in Nili-Ravi and Murrah buffaloes, respectively.

A non-significant effect of year of calving on service period was observed in present study, which was in line with the findings of (Chourasia *et al*., 1983; Saha *et al*., 2000). Saha *et al*., (2000) after analysing 1361 records of Murrah buffaloes maintained at National Dairy Research Institute Karnal, (India) reported a non-significant effect of year of calving on service period, however present finding were not in accordance with that of Shafique and Usmani, (1996); Singh and Nivasarkar, (2000) and Thevamanoharan, (2002), who reported that analysis of variance revealed a significant effect ($P<0.01$) of years of calving on service period of buffaloes.

The analysis of variance revealed non-significant effect of season of calving on service period which was in line with the findings of Shafique and Usmani, (1996); Singh and Nivasarkar, (2000). Shafique and Usmani, (1996) reported that seasonality of breeding and reproduction had no effect on service period in Nili-Ravi buffaloes. Singh and Nivasarkar, (2000) reported a non-significant effect of season of calving on service period in Bhadawari buffaloes.

On the other hand, findings of present study were not in accordance with the findings of Thevamanoharan, (2002) who reported a significant ($P<0.01$) effect of season of calving on service period in Nili-Ravi buffaloes in Pakistan.

Service period is closely related to calving interval. The longer the service period, the longer is the calving interval and higher is the cost of milk production because gestation period is more or less fixed with less variation. The service period has got negative correlation with the overall average milk yield of the animal. A period of about 60-80 days is considered highly desirable. Service period in present study is obviously higher, and can be brought down to a desirable value if better management, balanced nutrition, and proper heat detection with timely insemination and post partum ailments like retention of placenta and endometritis taken care of.

The effect of parity on service period in Nili-Ravi buffaloes was non-significant in the present study. Service period of 174.55±12.21 days was noticed in buffaloes in their first (1st) parity, while shortest service period of 147.31±32.80 days was observed in fourth (4th) parity in Nili-Ravi buffaloes.

The least squares mean for calving interval in Nili-Ravi herd in the present study was 473.72±3.56 days, which were in line with the findings of Shafique and Usmani, (1996); Thevamanoharan, (2002), who reported a calving interval of 482 and 496 days, respectively in Nili-Ravi buffaloes in Pakistan. A shorter calving interval of 461.68 days was reported by Jain and Tailor, (1994), in Surti buffaloes, while a longer calving interval of 552 days was reported by Khan *et al*., (1990) in Nili-Ravi buffaloes.

The analysis of variance revealed a significant effect of lactation number on calving interval, while a non-significant effect of year of calving was observed on the trait in present study. The findings of the present study were in line with the findings of Saha *et al*., (2000), who reported a non-significant effect of year of calving on calving interval after analysing 1361 records of Murrah buffaloes maintained at National Dairy Research Institute Karnal, (India).

The results of the present study were not in accordance with the findings of Khan (1986) and Thevamanoharan, (2002). Thevamanoharan, (2002) reported that analysis of variance revealed a significant effect ($P<0.01$) of the years of calving in Riverine buffaloes.

Analysis of variance revealed a non-significant effect of season of calving on calving interval. The findings of the present study were in line with the findings of Khan, (1996) and Singh and Nivasarkar, (2000) in Nili-Ravi and Bhadawari buffaloes.

The findings of the present study about non-significant effect of season of calving on service period were not in accordance with the findings of Khan, (1986) and Thevamanoharan, (2002) in Nili-Ravi buffaloes.

Calving interval has a great economic bearing on the lifetime production of dairy animals. Calving interval in Nili-Ravi buffaloes in present study is acceptable largely given the conditions and the climate of

Table 1. Effect of year and season of birth/calving and parity on different reproductive traits in Nili-Ravi buffaloes

Effects Traits	AFC (days)	PPOI (days)	SP (days)	CI (days)
Year of birth/calving				
1987	1566.73 ± 76.26	-	-	-
1988	1672.59 ± 94.98	-	-	-
1989	1716.44 ± 116.48	-	-	-
1990	1632.11± 83.78	243.93 ± 42.61	162.60 ± 33.46	473.22 ± 10.66
1991	1705.65 ± 139.75	436.76 ± 48.21	192.52 ± 54.92	489.62 ± 16.50
1992	1467.88 ± 93.73	190.29 ± 22.13	176.66 ± 29.15	478.61 ± 9.21
1993	1280.89 ± 93.91	147.98 ± 22.96	154.94 ± 29.98	458.55 ± 8.28
1994	1745.45 ± 70.23	145.35 ± 24.34	173.71 ± 65.25	479.74 ± 7.76
1995	1831.35 ± 78.92	137.72 ± 25.66	167.48 ± 43.67	469.45 ± 7.34
1996	1875.26 ± 78.47	122.09 ± 11.67	151.89 ± 11.54	456.03 ± 7.40
1997	1599.59 ± 116.31	99.32 ± 22.97	167.17 ± 22.46	473.00 ± 7.48
1998	-	154.39 ± 20.94	172.87 ± 76.34	479.91 ± 8.14
1999	-	95.09 ± 21.21	174.59+23.63	482.11± 7.30
2000	-	91.02 ± 19.87	168.00+82.23	473.80 ± 7.59
2001	-	87.34 ± 28.54	166.34+46.75	476.21 ± 7.18
2002	-	81.88 ± 21.95	160.93+13.73	468.17 ± 14.72
Season of birth/calving				
Spring	1675.23 ± 118.31	145.58 ± 23.40	165.65 ± 30.01	470.61 ± 6.45
Hot humid	1613.72 ± 133.36	142.89 ± 19.76	181.63 ± 33.08	484.22 ± 7.88
Dry humid	1694.94 ± 41.25	94.23 ± 29.89	159.21± 24.59	464.16 ± 4.25
Autumn	1561.74 ± 58.19	101.09 ± 32.26	164.86 ± 29.20	471.16 ± 6.11
Winter	1678.72 ± 69.64	176.24 ± 26.54	171.23 ± 30.31	478.47 ± 6.72
Parity				
I	-	206.05 ± 12.21	174.55 ± 12.21	482.55 ± 3.92
II	-	196.71± 12.48	175.51± 12.48	480.77 ± 3.83
III	-	213.32 ± 20.91	174.52 ± 20.91	478.62 ± 6.39
IV	-	248.77 ± 32.80	147.31+ 32.80	452.96 ± 9.99
V	-	270.74 ± 110.88	175.31 ± 110.8	

Muzaffarabad. In order to reduce the unproductive period and to enhance calf crop during the lifespan of dairy animals, reduction in the length of calving interval seems most important. Ashfaq and Mason, (1954) observed that calving interval was reduced from 20 months to 13 months in 4-year period because of improvement in the management of Nili-Ravi buffaloes at Bhadurnagar during 1947-51. The calving interval in farm animals is mainly determined by service period. The service period in buffaloes is generally reported to be very long because of silent heat and ovarian inactivity during some seasons of the year, embryonic mortality, and infertile services etc. In general, with the initiation of breeding at 45 to 50 days post-calving, better management of post-partum oestrus ailments especially retention of placenta, pyometra and endometritis, coupled with an intensive programme of heat detection, efficient practices of insemination will significantly shorten calving interval.

Reproductive performance of buffaloes of the present study is comparable to that reported previously. It can be concluded from the present study that the reproductive performance of Nili-Ravi buffaloes in the present study considering the harsh environment of Azad Kashmir was comparable and even better than the findings of many scientists in Pakistan and if the effects of environment are minimized to some extent a better performance with respect to reproduction can be expected.

REFERENCES

Asghar, A. A., M. A. Chaudhry and J. Iqbal, (1985). Productive and reproductive performance of Nili-Ravi buffaloes under optimal conditions of feeding and management. Sixth Annual Report 1984-85. Livestock Production Research Institute, Bahadurnagar, Okara, Pakistan.

Ashfaq, M., and I. L. Mason, (1954.) Environmental and genetical effects on milk yield in Pakistani buffalo. Empire J. Exper. Agric., 22(87): 161-175.

Cady, R. A., S. K. Shah, E. C. Schemerhorn and R. E. McDowell, (1983). Factors affecting performance of Nil-Ravi buffaloes in Pakistan. J. Dairy Sci., 66: 578-586.

Chaudhary, M. A., A. A. Asghar and A. Ali, (1995). Factors affecting age at first calving in Nili-Ravi buffaloes under feedlot conditions. 16th Ann. Report (1996). Livestock Production Research Institute Bahadurnagar, Okara.

Chourasia, S. K., B. S. Gurung and M. M. Dhingra, (1983). Studies on first service period and its correlation with some of the reproductive traits in Murrah buffaloes. Livestock Advisor, 8:23-26.

El-Fouly, M. A., Y. Afiefy and A. K. Kirrella, (1977). Service period length in a herd of Experimental buffaloes. Egypt. J. Anim. Prod. 17: 63-73.

Harvey, W. R., (1990). Users' Guide for LSMLMW and MIXMDL, Mixed model least squares and maximum likelihood computer program. PC-2 version, the Ohio State University, Columbus, USA.

Ingawale, M. V., and R. L. Dhoble, (2004). Buffalo reproduction in India: An overview. Buffalo Bulletin Vol. 23(l): 4-9.

Jain, L. S., and S. P. Tailor, (1994). Inheritance of reproduction traits in Surti buffaloes, Indian Vet J., 71(7): 684-688.

Javaid, R., and M. D. Ahmad, (1969). Heritability estimates of age at first calving and calving interval in Nili-Ravi buffaloes, Pakistan J. Sci. 6: 79-82.

Khan, A., (1996). Seasonal variation in breeding patterns of buffalo in Punjab. M. Sc. Thesis, Univ. of Agric. Faisalabad, (CVS Lahore).

Khan, M. A., (1986). Genetic analysis of a purebred herd of Nili-Ravi buffaloes, Ph.D Thesis, University of Agriculture, Faisalabad (Pakistan).

Khan, M. A., (2002). Reproductive efficiency of farm animals in the tropics. Animal Agriculture Bureau (AAB). Rawalpindi, Pakistan.

Khan, M. A., M. D. Ahmad, M. Abdullah and S. Ali, (1990). Effect of age at first calving on some performance traits in Nili-Ravi buffaloes. Pakistan Vet J., 10 (i): 25-27.

Majeed, M.A., A. W. Qureshi, and M. Tayyab, (1966). Seasonal variations in calving frequency of West Pakistan buffalo and cow and their effect on reproductive efficiency (March-June), West Pakistan, J, Agri. Res., 4(1-2), 140.

Rao, B. R., U. G. Patel and S. S. Tahman, (1973). Seasonal trend in reproductive behavior of Surti buffaloes-service period and post partum oestrus interval. Ind. vet. J. 50:413-417.

Rehman, A., (1986). Effect of some environmental factors on the reproductive performance of Nili-Ravi buffaloes. M. Sc thesis. Univ. of Agric. Faisalabad.

Saha, S., D. K. Sadana and S. Saha, (2000). Effect of genetic and non-genetic factors on reproduction traits in Murrah buffaloes. Ind. J. of Anim. Hlth. 39(1): 41-42.

Shafique, P., and R. H. Usmani, (1996). Reproductive performance and milk production of Nili-Ravi buffaloes maintained under Barani (Rain-fed) Areas of Punjab Pakistan vet. J., 16(4):168-171.

Shah, S. K., (1991). Buffaloes of Pakistan. Published by Pakistan Agricultural Research Council, Islamabad. 1991.

Singh, R. V., and A. E. Nivasarkar, (2000). Production and reproduction potential of Bhadawari buffalo. Buffalo J. 16(2): 163-173.

Thevamanoharan, K., (2002). Genetic analysis of performance traits of swamp and Riverine buffalo, Ph. D Thesis, Katholieke University Leuven, Belgium.