REPRODUCTIVE PERFORMANCE OF DAIRY BUFFALOES UNDER PERI-URBAN COMMERCIAL FARMING IN NWFP, PAKISTAN

M.S. Qureshi, H.A. Samad[1], Nazir Ahmad[1], G. Habib[2], A.D. Anjum[1] and M.M. Siddiqui[2]
Veterinary Research Institute NWFP, Peshawar, [1]University of Agriculture, Faisalabad; [2]NWFP Agricultural University Peshawar, Pakistan.

ABSTRACT

Fifty one dairy buffaloes in their last two months of gestation were selected at seven peri-urban commercial farms located within a radius of 70km around Peshawar. These animals were monitored from parturition until 150 days post-partum. After parturition, rectal examination of reproductive organs was carried out. Estrus detection was made through visual signs and use of intact bulls. Milk samples were collected and analyzed with radio- immunoassay for milk progesterone levels. The mean postpartum uterine involution (PUI) interval was 34.30 ± 1.33 days, ranging from 21 to 74 days. PUI interval was upto 35 days in 55% buffaloes and upto 50 days in 85% buffaloes. During 150 days after calving, 69% buffaloes were found in estrus and the remaining 31% animals remained anestrous. The overall mean postpartum estrus interval was 69.03 ± 6.03 days, the range being 21 to 147 days. Mean postpartum ovulation interval was recorded as 59.37 ± 4.76 days, ranging from 24 to 150 days. The postpartum ovulation and estrus intervals were significantly longer ($P < 0.05$) in buffaloes calving during their normal breeding season than the low breeding season calvers. The occurrence of ovulatory, anovulatory and silent estrus was recorded as 43.9, 4.6 and 51.5%, respectively. Silent ovulation was more prevalent in low breeding season than normal breeding season calvers (70.6 vs 29.4%). In true anestrous buffaloes, milk progesterone concentrations remained constantly low, however, silent ovulations were associated with increasing progesterone levels. It was concluded that postpartum reproductive performance in buffaloes under commercial peri-urban farming system remained lower than desirable levels which offers scope for further improvement through improvements in estrous detection efficiency and better feeding and management of buffaloes.

INTRODUCTION

In Pakistan, buffalo population recorded an annual growth rate of 4.7% during the period from 1982 to 1992, which is highest among dairy buffaloes of the world and the population reached 20.2 million heads during 1995-96 (Economic Survey, 1995-96), showing the buffalo as a popular farm animal of the country. However, the reproductive performance of animals of this species is not satisfactory. Late maturity and long calving intervals are the main factors adversely affecting the reproductive efficiency of buffaloes. The delay of first postpartum ovulation and estrus has been considered to be the major factor leading to a prolonged service period in Egyptian buffaloes (El-Fouly, 1983). According to Baruselli (1991), the first signs of ovarian activity in Murrah buffaloes occurred at an average of 36.6 days and estrus at an average of 57 days postpartum. In Indonesian Swamp buffaloes (Lubis and Fletcher, 1987), postpartum intervals to first estrus and conception was prolonged due to low feeding levels. In Nili-Ravi buffaloes maintained at a state farm in Pakistan, about 76% buffaloes came into estrus within two months after calving (Chaudhry *et al.*, 1990). However, there is relatively little information in the literature regarding various parameters of the reproductive performance of buffaloes maintained under peri-urban conditions of NWFP, Pakistan. The present study was, therefore designed to investigate the reproductive performance of dairy buffaloes kept under the existing peri-urban commercial farming in NWFP.

MATERIALS AND METHODS

Fifty one dairy buffaloes in their last two months of gestation were selected at seven peri-urban commercial farms located within a radius of 70km around Peshawar. These buffaloes were monitored from parturition to 150 days postpartum for uterine involution, postpartum ovulation and postpartum estrus. Based upon the month

of calving, the calving season was divided into two classes viz. Normal breeding season (NBS; August-January) and low breeding season (LBS; February-July). Limited suckling of the animals by calves at the time of milking was allowed according to the prevailing practice. Past reproductive history of the selected animals was recorded.

After parturition, rectal examination of reproductive organs was carried out on days 14 and 21, and then fortnightly, until the occurrence of the first estrus. Position of the reproductive organs was recorded and the return of uterus to pelvic cavity was considered as an indication of complete uterine involution. Estrus detection was made twice daily, from 15 days postpartum until resumption of estrus. In addition to visual observation of vulvular mucous, frequent micturition and bellowing, an intact bull was used for detection of estrus at each farm. Postpartum ovulation was confirmed by palpation of an ovulation depression or a very soft corpus luteum or luteal tissue.

Milk samples were collected every week, fat layer was removed and 100μl of 0.1% sodium azide was added to 5ml of milk sample, as a preservative. Samples were stored at B20°C until used for determination of milk progesterone levels (MPL), using radio-immunoassay procedures approved by FAO/IAEA (1993). The data obtained were subjected to statistical analysis using analysis of variance procedures described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Uterine involution

The mean value for postpartum uterine involution (PUI) interval was 34.30 ± 1.33 days, ranging from 21 to 74 days (Table 1). Uterine involution was completed within 33 days in 55% buffaloes and within 50 days postpartum in 85% buffaloes. In the remaining 15% animals, uterine involution was completed between 51 and 60 days after calving.

The mean PUI interval of 34.30 ± 1.33 days recorded in this study is comparable to 34.7 ± 1.5 days in Egyptian buffaloes (El-Shafie *et al.*, 1983) and 32.9 days in Sri Lankan buffaloes (Perera *et al.*, 1984). However, shorter PUI interval of 27.5 ± 8.3 (Chaudhry *et al.*, 1987) and 28.37 ± 1.36 days (Chaudhry *et al.*, 1990) have been reported in Nili-Ravi buffaloes. The above studies were conducted at state farms where management practices were presumably better than those at the private farms included in the present study. Similarly, longer time for completion of uterine involution in buffaloes was reported by some workers. Indian river buffaloes completed uterine involution in 45 days (Roy and Luktuke, 1962) and in Egyptian buffaloes a PUI interval of 40.3 ± 1.2 days was reported by Aboul-Ela *et al.* (1988). Variations in the finding among various studies may be related to differences in criteria and method of recording, seasons, breed and management.

In the present study, majority (62.5%) of buffaloes completed uterine involution between 30 and 50 days postpartum which seems to be a desirable interval. Graves *et al.* (1968) reported that PUI interval shorter than 20 days was associated with very low fertilization rates, which was attributed to the physical barrier to sperm transport and implantation of zygote (Short *et al.*, 1990).

In buffaloes calving during the NBS, it took slightly longer time for uterine involution to complete than animals calving in the LBS (36.19 ± 5.07 vs 31.52 ± 3.09 days, Table 1). However, the difference was non-significant statistically.

Postpartum estrus and ovulation

During 150 days after calving, 68.63% buffaloes were found in estrus and 31.37% animals remained anestrous (Fig.1). The overall mean postpartum estrus interval (PEI) was 69.03 ± 6.03 days, ranging from 21 to 147 days (Table 1). PEI was significantly higher ($P<0.01$) in the LBS than the NBS calvers. Based on detection of palpable corpus luteum per rectum, the mean postpartum ovulation interval (POI) was recorded as 59.37 ± 4.76 days, ranging from 24 to 150 days. A positive correlation ($r2 = 0.81$, $P<0.01$) was observed between the PUI interval and the POI (Fig.2), indicating that POI would be longer in animals with slow uterine involution.

In the present study, a shorter PEI in buffaloes was recorded than that reported by other workers. Ishaque (1969) reported that 44% of Nili-Ravi buffaloes showed estrus within 120 days postpartum, while 56% had a PEI longer than 120 days. Similarly, in studies conducted by Wahid (1975), 55% buffaloes came into estrus within 200 days after parturition. Under village conditions in Punjab, 30% buffaloes showed estrus within 90 days while 70% beyond 90 days postpartum (Chaudhry *et al.*, 1985). A wide range of 30-750 (Jost, 1979) and 21-915 days (Zafar, 1983) has been reported for PEI of Nili-Ravi buffaloes under village conditions in Pakistan. However, at state farms relatively shorter PEI of 124 ± 14.58 days, ranging from 22 to 280 days, was reported for Nili-Ravi buffaloes (Chaudhry *et al.*, 1990).

The shorter PEI recorded in the present study might be due to better nutritional status of the experimental animals, as the animals were mostly kept on commercial basis for milk production and were fed high energy diets which supported optimum body condition score in the animals. Furthermore, the use of intact bulls in the present study also helped in timely detection of estrus in these buffaloes.

Table 1 shows that PEI was significantly longer in buffaloes calving in the LBS than those calving during the NBS, indicating that animals calving during their normal calving season exhibit postpartum estrus early. This confirms the findings of Ahmad *et al.* (1981) who concluded that in buffaloes calving in winter and spring, the first postpartum estrus and conception is delayed till the following autumn or winter, resulting in longer calving intervals. In contrast, animals calving in summer and autumn exhibit postpartum estrus and conception during autumn and winter, resulting in shorter calving intervals.

A total of 66 estrus periods were observed in the selected animals during the study period (Table 2). Based on the observable esturs, rectal palpation and MPL, three types of estrus periods were recorded i.e. ovulatory esterus (43.9%), anovulatory estrus (4.6%) and silent estrus (51.5%). About 62.1% of the total 29 ovulatory estrus periods occurred in NBS calvers while the remaining 37.9% in the LBS calvers. Anovulatory estrus was not a notable problem in the experimental animals. However, silent ovulation was identified as the most prevalent reproductive problem because 29.4% of the cases occurred in NBS calvers and 70.6% in LBS calvers.

In a previous study, 27.7% of 47 Egyptian buffaloes showed ovulatory estrus, 10.6% anovulatory estrus and 64.0% silent estrus (Aboul-Ela *et al.*, 1988). The high incidence of silent estrus in buffaloes was attributed to poor expression of estrus symptoms and inefficient detection of estrus. The incidence of silent estrus in the present study was lower than 82.4 and 56.0% reported for Egyptian buffaloes by Khattab *et al.* (1988; 1990) but higher than 11% reported for suckled swamp buffaloes (Jainudeen *et al.*, 1983). Poor expression or even complete absence of estrus signs have been attributed to lack of responsiveness of ovaries to gonadotrophins and poor follicular development (Mudgal, 1992), low concentration of tri-iodothyronine and thyroxine (Borady *et al.*, 1985), low levels of calcium with a significantly low calcium-phosphorus ratio (Pathak *et al.*, 1991).

In the present study, although intact bulls were used twice daily for detection of estrus alongwith regular monitoring of buffaloes for visual estrus symptoms like frequent micturition, vulvular mucous and bellowing, majority of estrus periods might have been missed due to poor expression of the signs.

Table 1: Effect of breeding season on various parameters of reproductive performance in buffaloes (means ± SE)

Parameters		Calving period	
	Overall	NBS*	LBS**
Postpartum uterine involution interval (days)	34.30 ±1.33	36.19 a ±5.07	31.52 a ±3.09
Postpartum oestrus interval (days)	69.03 ±6.03	55.95 a ±4.90	91.15 b ±11.61
Postpartum ovulation interval (days)	59.37 ±4.76	55.24 a ±5.77	65.11 a ±7.86

*NBS = Normal breeding season
**LBS = Low breeding season
Values with different letters in a row differ significantly ($P < 0.01$)

Table 2: Resumption of postpartum ovarian activity based on milk progesterone concentrations and clinical signs of oestrus in buffaloes.

Oestrus group	Oestrus events	Calving period	
		NBS*	LBS**
	Number	Number	Number
Ovulatory oestrus	29 (43.9)	18 (62.1)	11 (37.9)
Anovulatory oestrus	3 (4.6)	2 (66.7)	1 (33.3)
Silent oestrus	34 (51.5)	10 (29.4)	24 (70.6)
Total	66 (100.0)	30 (45.5)	36 (54.5)

*NBS = Normal breeding season
LBS** = Low breeding season
Values in parenthesis indicate percentage.

In true anestrus buffaloes, MPL remained constantly low. Figure 3 shows MPL of buffaloes A005, A255, B113 and B300, which did not show estrus symptoms during the study period. Buffalo A005 showed true anestrus, whereas in buffaloes A255, B113 and B300, silent ovulations were noted which were based upon increasing MPL and findings of rectal palpation. Similarly, in a study on 17 complete postpartum periods in Murrah buffaloes in Sri Lanka, plasma progesterone concentrations remained basal (<0.25 ng/ml) for a

period ranging from 92-210 days (Perera *et al.*, 1984). In swamp buffaloes, Perera (1981) found that postpartum anestrus was due to a failure in the resumption of ovarian cyclicity in the suckled buffaloes. Based on these results, it may be concluded that under field conditions PUI interval in buffaloes was longer than the state farms. The lower postpartum reproductive performance under field conditions necessitates further improvement through use of efficient estrus detection techniques and improved management and feeding at the private buffalo farms.

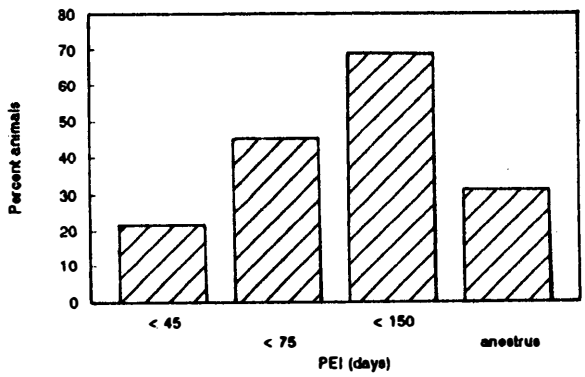

Fig. 1: Postpartum oestrus interval (PEI) in buffaloes.

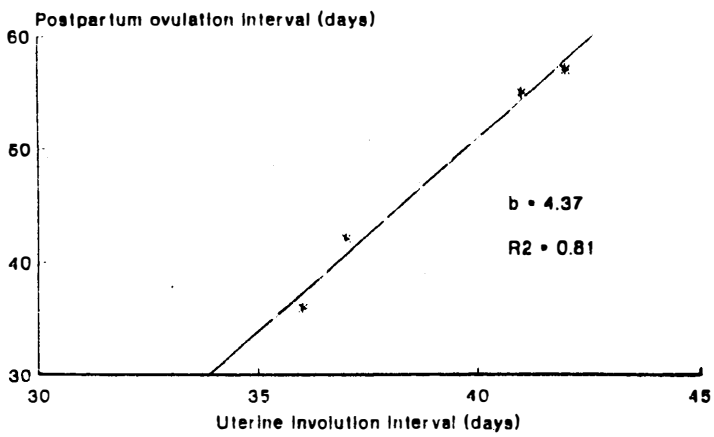

Fig.2: Relationship of uterine involution with ovulation in postpartum buffaloes

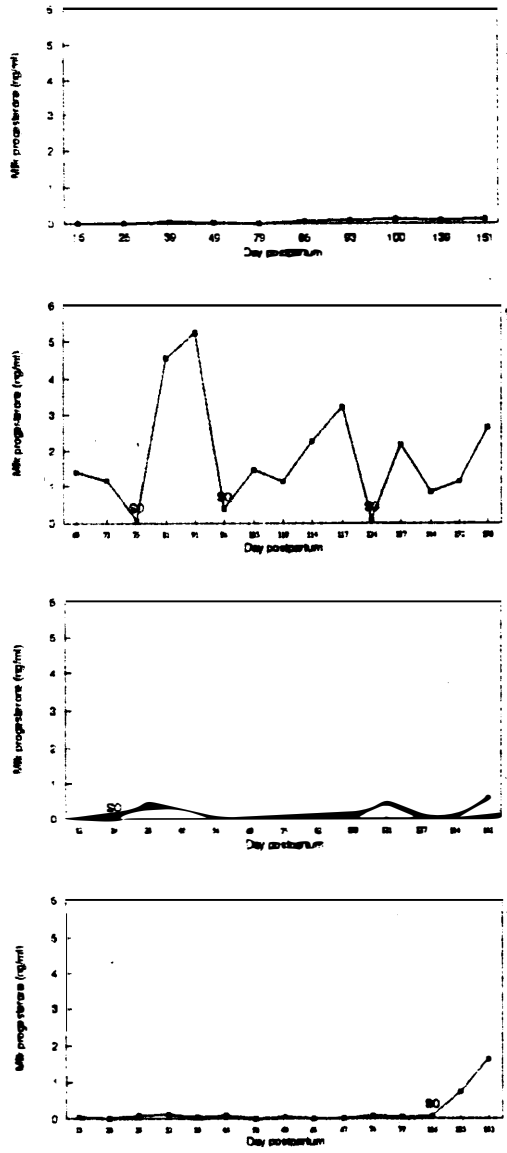

Fig. 3: Milk progesterone levels in buffaloes during true anoestrus (A005) and silent ovulation (SO) (A255, B113, B300).

ACKNOWLEDGEMENT

This research was conducted under the National Coordinated Buffalo Research Programmes sponsored by ARP-II/PARC, Islamabad. Cooperation of Dr. R.H. Usmani, National Coordinator of the Programme in planning and execution of this study is highly acknowledged.

REFERENCES

Aboul-Ela, M.B., R.M. Khattab, F.E. Al-Keraby, M.M. Shafie and L.H. Bedier, 1988. Patterns of ovarian and estrous activity and induction of cyclic activity during the postpartun period in Egyptian buffaloes. Proc. Research Coordination Meeting on Optimizing Grazing Animal Productivity in the Mediterranean and North African Regions with the Aid of Nuclear Techniques. Rabat, Morocco, 239-253.

Ahmad, N., R.A. Chaudhry and B.B. Khan, 1981. Effect of month and season of calving on the length of subsequent calving interval in Nili-Ravi buffaloes. Anim. Reprod. Sci., 3: 301-306.

Baruselli, P.S., 1991. Postpartum ovarian activity and reproductive performance in buffaloes. Proc. Cong. Brasileiro Repr. Anim., Belo Horizonte, Brazil, 2: 460.

Borady, A.M.A., A.E. Abdelaal and H.A.M. Farghaly, 1985. Seasonal variation in the thyroid hormones and reproduction in the Egyptian water buffalo. Egyptian J. Anim. Prod. 25: 83-92.

Chaudhry, S.A., H.A. Samad and M.H. Javed, 1985. The occurrence of postpartum estrus and fertility in buffaloes and cows under field conditions. Pakistan Vet. J., 5: 45-46.

Chaudhry, M.A., M. Ahmad and N.U. Khan, 1987. Postpartum involution of the cervix and uterus in Nili-Ravi buffaloes. Buffalo J., 3: 87-92.

Chaudhry, M.A., M.H. Chohan and T.N. Pasha, 1990. Uterine involution and postpartum estrus in primiparous Nili-Ravi buffaloes. Pakistan J. Agric. Res., 11: 183-189.

Economic Survey, 1995-96. Government of Pakistan Finance Division, Economic Advisor's Wing, Islamabad.

El-Fouly, M.A., 1983. Some reproductive aspects of Egyptian buffalo cow. Buffalo Bulletin, 3: 3-15.

El-Shafie, M.M., A.M.A. Borady, H.M. Mourad and R.M. Khattab, 1983. Physiological and seasonal factors affecting reproductive performance of Egyptian buffalo heifers. Egyptian J. Anim. Prod., 23:1-14.

FAO/IAEA, 1993. Progesterone RIA Kit Protocol, version 2.0, Joint FAO/IAEA Programme in Animal Production and Health, Seibersdorf, Austria.

Graves, W.E., J.W. Lauderdale, E.R. Hauser and L.E. Casida, 1968. Relationship of postpartum interval to pituitary gonadotropins, ovarian follicular development and fertility in beef cows. Univ. Wisconsin Res. Bull. No.270: 23-26.

Ishaque, S.M., 1969. Butter fat and solids not fat contents in buffalo milk. Sixth Annual Report, Directorate of Livestock Farms, Punjab, Lahore.pp.190-192.

Jainudeen, M.R., W. Sharifuddin and F.B. Ahmad, 1983. Relationship of ovarian contents to plasma progesterone concentration in swamp buffaloes (Bubalus bubalis). Vet. Rec., 13: 369-372.

Jost, N.P., 1979. Livestock production and marketing survey, Punjab Draft Report. Directorate of Livestock Production, Extension and A.I. Services, Lahore. pp.17-20.

Khattab, R.M., A.H. Barkawi and M.B. Aboul-Ela, 1988. Pattern of ovarian and estrous activity in problem buffaloes as monitored by plasma progesterone concentration. Buffalo J., 2: 173-181.

Khattab, R.M., M.B. Aboul-Ela, A.H. Barkawi and A.E. Abdel-Aal, 1990. Physiological causes influencing open period in Egyptian buffaloes of hot season calvers. Buffalo J., 2: 153-160.

Lubis, A. and I.C. Fletcher, 1987. Postpartum reproduction in swamp buffalo cows at two feeding levels. Anim. Reprod. Sci. 13:183-189.

Mudgal, V.D., 1992. Reproduction in River Buffaloes. In: Buffalo Production, Eds: N.M. Tulloh and J.H.G. Holmes. Elsevier, Amsterdam. Pp.171-181.

Pathak, M.M., A.V. Patel and V.M. Mehta, 1991. Study of serum calcium and phosphorus during placental expulsion in Surti buffalo. Indian J. Anim. Reprod., 12:51-55.

Perera, B.M.A.O., H. Abeygunawardena, A. Thamottheram, H. Kindhal and L.E. Edquist, 1981. Peripartal changes of estrone, progesterone and prostaglandin in the water buffalo. Theriogenology, 15:463-467.

Perera, B.M.A.O., L.N.A. De-Silva and A.M. Karunaratne, 1984. Studies on reproductive endocrinology and factors influencing fertility in dairy and draught buffaloes in Sri Lanka. Proc. The use of nuclear techniques to improve domestic buffalo production in Asia. Manila, Philippines, pp: 13-28.

Roy, D.J. and S.N. Luktuke, 1962. Studies on involution of the uterus in buffalo. Indian J. Vet. Sci., 32: 208-213.

Short, R.E., R.A. Bellows, R.B. Straightmiller, J.G. Birardinelli and E.E. Custer, 1990. Physiological mechanism controlling anestrus and infertility in postpartum beef cattle. J. Anim. Sci., 68: 799-816.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and procedures of statistics B A biometrical approach. 2nd ed. McGraw Hill Book Company, New York.

Wahid, A.W., 1975. Livestock resources of Pakistan. Monograph. 7. Pakistani Buffalo.pp.84-87.

Zafar, A.H., 1983. Economics of rural dairy animals in the canal irrigated area of the Punjab. LPRI, Bahadurnagar, Okara. pp: 11-16.