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Influence of Parity and Month of Peak Calving Season on Postpartum Estrous Activity and Fertility of Nili-Ravi Buffaloes

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Abstract: Data recorded in respect of postpartum estrous activity and fertility of a herd of Nili-Ravi buffaloes maintained at the Livestock Research Station of the National Agricultural Research Centre, Islamabad, were analyzed to examine the effects of parity and month of calving. During the study period of two years (1998 to 1999) a total of 103 buffaloes calved at the research station. Mean values for the overall interval to first postpartum observed estrus (PPIE), first service conception rate (RSCR), services per conception (SPC) and postpartum interval to conception (PPIC) were 84.4 ± 8.6 days, 53.4%, 1.7 ± 0.12 and 104.7 ± 15.3 days, respectively. The PPIE and PPIC were shorter for buffaloes in lactation number 7 or more than for those in lactation number 1 to 6. Buffaloes calving during the months of September had shortest PPIE and PPIC (43.7 ± 8.4 and 51.8 ± 9.6 days, respectively) and lowest number of SPC (1.2 ± 0.1). Highest FSCR 82% was observed for buffaloes calving during the month of August. Buffaloes calving during the month of March had the longest PPIC (211.7 ± 15.6 days) and highest number of SPC (2.8 ± 0.3). Lowest FSCR (0%) was observed for buffaloes calving during the months of February to April. In conclusion, the buffaloes which calved towards the end of peak calving season (August to December) were most efficient in terms of postpartum reproduction and fertility.

Key words: Buffalo, month of calving, parity, postpartum estrus, fertility

Introduction

Nili-Ravi buffalo is the major dairy animal of Pakistan. Like other breeds of dairy buffalo, the Nili-Ravi has lower reproductive efficiency when compared with dairy cattle (Shah, 1991; Usmani, 1998). This is evident from its longer intervals to resumption of postpartum estrous activity and fertility (Shafiq and Usmani, 1996). Several non-genetic factors have been reported to influence the postpartum intervals to conception in the Nili-Ravi buffalo. These include location of herd (Naqvi, 2000) calf suckling (Usmani *et al*., 1990) parity of the buffalo and season of calving (Naqvi, 2000).

Conflicting reports are found in the literature regarding the effects of parity and month of calving on the postpartum interval to conception in this breed of the buffalo. Shafiq and Usmani (1996) did not observe any parity effect on the service period upto 6th lactation whereas other workers (Chaudhry *et al*., 1990; Naqvi, 2000) have reported a negative correlation of the service period with the lactation number of the Nili-Ravi buffalo. Similarly, the effect of month of calving on the postpartum interval to conception are not clear.

The present study was, therefore, designed to examine the effect of parity, specific month of calving and their interactions on the resumption of postpartum estrous activity and some variables of fertility in the Nili-Ravi buffaloes.

Materiels and Methods

Nili-Ravi buffalo herd maintained at the Livestock Research Station of the National Agricultural Research Centre, Islamabad was used for this study over a period of two years i.e., 1998 and 1999. The herd consisted of 85 adult, breed able buffaloes. A total of 103 parturitions took place during the study period. All buffaloes were maintained under similar conditions of feeding and management. They were fed 50-60 kg seasonal green fodder (mainly barseem, maize and oats) per head per day supplemented with 3 to 5 kg concentrate ration depending on the daily milk yield.

The buffaloes were hand milked twice daily (3 am and 2 pm) and limited suckling by calf was allowed for milk let down.

Starting an day 30 postpartum, all buffaloes were observed for estrous, activity twice daily (morning and evening) with the use of a teaser bull. The estrual buffaloes were inseminated twice at 12th and 20th hours after the onset of estrus using fresh semen collected from buffalo bulls maintained at the research station. All inseminated buffaloes were tested for onset of pregnancy through rectal palpation of genitalia conducted on days 50 to 60 post-breeding.

The postpartum interval to first observed estrus, services per conception and postpartum interval to conception were recorded for individual buffaloes and first service conception rate was calculated. The lactation number of buffaloes calving during the study period ranged from 1 to 9. In order to study the effect of parity, buffaloes were divided into five parity groups. The parity group I, II, III, IV and V consisted of buffaloes in lactation number one, two, three and four, five and six and more than six, respectively. The data were analyzed using analysis of variance technique (SYSTAT, 1996). Following statistical model was used for the analysis:

$$Yij = U + Pi + Mj + Eij$$

Where:

- Yij = Denoted dependent variable
- U = Overall mean
- Pi = Effect of parity group
- Mj = Effect of month of calving

Initially, the statistical model included interactions between parity and month of calving but as these interactions were found non-significant, they were excluded from the final model.

Results

The overall mean values for postpartum interval to first observed estrus (PPIE), first service conception rate (FSCR),

services per conception (SPC) and postpartum interval to conception (PPIC) were 84.4 t 8.6 days, 63.4%, 1.7 ± 0.12 and 104.7 ± 15.3 days, respectively.

Table 1: Effect of Parity of Nili-Ravi Buffaloes on Postpartum Interval to first Observed Estrus (PPIE)

Parity Group	Lactation Number	Number of Animals	PPIE (days)
I	1	30	94.2 ± 7.1
II	2	25	80.2 ± 8.8
III	3 and 4	21	81.9 ± 5.6
IV	5 and 6	19	91.7 ± 9.2
V	>6	8	49.7 ± 14.9*
Overall		103	84.4 ± 8.6

*Value (Mean ± SD) was shorter than the value of PPIE for other parity groups ($p < 0.05$)

Table 2: Effect of Parity of Nili-Ravi Buffaloes on Some Variables of Postpartum fertility

Parity Group	n	FSCR (%)	SPC	PPIC (days)
I	30	40	2.0 ± 0.20	127.0 ± 9.9
II	25	60	1.7 ± 0.20	96.4 ± 10.6
III	21	57	1.6 ± 0.15	101.7 ± 11.4
IV	19	53	1.6 ± 0.12	105.5 ± 11.3
V	8	75	1.4 ± 0.15	58.6 ± 17.9*
Overall	103	53.4	1.7 ± 0.12	104.7 ± 15.3

FSCR = First Service Conception Rate, SPC = Services Per Conception. PPIC = Postpartum Interval to Conception
*Value (Mean ± SD) was shorter than the value of PPIC for other parity groups ($p < 0.05$)

Table 3: Effect of Month of Calving on Postpartum Interval to First Observed Estrus (PPIE) in Nili-Ravi Buffaloes

Month of Calving	(n)	PPIE (days)
January	-	-
February	06	170.8 ± 16.8[a]
March	04	170.5 ± 23.8[a]
April	06	103.6 ± 9.1[a]
May	08	114.8 ± 11.3[a]
June	10	94.4 ± 5.9[ab]
July	27	83.6 ± 6.4[ab]
August	17	60.8 ± 5.1[b]
September	14	43.7 ± 8.4[b]
October	04	59.0 ± 15.6[b]
November	04	49.7 ± 9.2[b]
December	03	53.3 ± 11.3[b]
Overall	103	84.3 ± 8.6

[ab]Values (Mean ± SD) within same column with different superscripts differ ($p < 0.01$)

Table 4: Effect of Month of Calving on Some Variables of Postpartum Fertility in Nili-Ravi Buffaloes

Month of Calving	n	FSCR (%)	SPC	PPIC (days)
January	-	-	-	-
February	06	Nil	2.5 ± 0.3[a]	203.7 ± 17.3[a]
March	04	Nil	2.8 ± 0.3[a]	211.7 ± 15.6[a]
April	06	Nil	2.7 ± 0.4[a]	145.3 ± 2.8[a]
May	08	25[a]	2.0 ± 0.3[ab]	144.7 ± 17.6[a]
June	10	60[ab]	1.6 ± 0,3[ab]	115.9 ± 9.0[ab]
July	27	59[ab]	1.7 ± 0.2[ab]	105.4 ± 9.7[ab]
August	17	82[b]	1.2 ± 0.1[b]	63.7 ± 5.8[b]
September	14	78[b]	1.2 ± 0.1[b]	51.8 ± 9.6[b]
October	04	75[b]	1.6 ± 0.4[ab]	71.7 ± 6.2[b]
November	04	50[ab]	1.7 ± 0.5[ab]	70.2 ± 8.9[b]
December	03	66[ab]	1.3 ± 0.3[b]	60.3 ± 18.3[b]
Overall	103	53	1.7 ± 0.1	104.7 ± 15.3

[ab]Values (Mean ± SD) within same column with different superscripts differ at $p < 0.05$

Effect of parity: Mean values of the postpartum interval to first observed estrus for the five parity groups are presented in Table 1.

The means of PPIE for parity groups I to IV ranged from 80.2 to 94.2 days and did not differ from each other. The PPIE was shortest for buffaloes of parity group V (49.7 ± 14.9 days) which differed significantly from the means of other four parity groups ($p < 0.05$). Number of buffaloes in the parity group V was, however, lower than the number in other groups.

Data regarding effect of parity group on some variables of postpartum fertility are presented in Table 2.

First service conception rate ranged from 40 to 75% and did not differ between parity groups. Lowest and highest values of FSCR were observed for buffaloes in parity group I and V, respectively. Mean number of services per conception for various parity groups ranged from 1.4 to 2.0 and did not differ from each other.

For various parity groups, the postpartum interval to conception or service period followed the same pattern as PPIE. The mean values of PPIC for parity group I to IV ranged from 96.4 to 127.0 days and did not differ from each other. Buffaloes of the parity group V showed significantly lower PPIC than other four groups ($p < 0.05$).

Effect of month of calving: Mean values for the postpartum interval to first observed estrus for buffaloes calving during different months are presented in Table 3. No buffalo calved during the month of January in both years. Maximum number of calvings were observed during the month of July 26.2% followed by August 16.5% and September 13.6%. These months, therefore, represented the peak calving season of buffaloes at the research station. Lowest values of the PPIC ranging from 43.710 60.8 days were recorded for buffaloes which calved during the months from August to December. Buffaloes calving during the months from February to May had highest v alues for the PPIE which ranged from 103.6 to 170.8 days. Mean values of PPIE were intermediate for the buffaloes which calved during the months of June and July and ranged from 83.6 to 94.4 days.

Results pertaining to effect of month of calving on some variables of postpartum fertility of buffaloes are presented in Table 4.

The first service conception rate remained zero for 16 buffaloes which calved during the months of February to April. For the remaining months of calving, highest FSCR was recorded for August followed by September. The mean number of services per conception was highest (ranging from 2.5 to 2.8) for buffaloes calving during the months of February to April. Lowest SPC was observed for buffaloes calving during the months of August, September and December where its value remained lower than 1.5.

The pattern of the effect of month of calving on postpartum interval to conception was similar to that observed for PPIE. Longest and shortest PPIC was recorded for buffaloes calving during February to May (range 144.7 to 211.7 days) and August to December (range 51.8 to 71.7 days) respectively.

Discussion

Results regarding overall reproductive performance of postpartum buffaloes of the present study are comparable with those of several studies conducted under controlled experimental conditions of proper detection of estrus and timely breeding or insemination of Nili-Ravi buffaloes (Usmani *et al*., 1985; Chaudhry *et al*., 1990; Qureshi *et al*., 1999). The overall postpartum interval to conception the service period recorded in the present study (104.7 days) is however, much shorter than the values reported for this economically important reproductive variable in the Nili Ravi buffaloes (Naqvi, 2000). In these studies, the average length of service period was reported to range

from 210 to 243 days. Factors responsible for this large difference could be many but two important causes need to be mentioned here. Firstly, the results reported by the above mentioned studies were based on retrospective analyses of the reproductive performance data recorded at buffalo farms under routine managemental conditions. Obviously, factors like regularity of estrous detection and timely insemination of buffaloes were, at least in part, lacking in these studies. This hypothesis gets further support if we consider the longer length of postpartum interval to first observed estrus and higher number of services per conception (>2.0) reported by these workers (Chaudhry and Pasha, 1988; Shah *et al*., 1989). The second major cause of shorter service period recorded for the buffaloes of the present study could be the practice of double insemination of estrual buffaloes using fresh semen. Double insemination of estrual buffaloes (8-hours apart) is expected to cover any deficiency in the accuracy of detection of onset of estrus, thus resulting into better chances of fertilization. Moreover, the conception rate in buffaloes after natural service or use of fresh semen, has been reported to be higher than that observed after the use of frozen-thawed semen (Qureshi *et al*., 1988).

Results of the present study confirm our previous observation that from first to sixth lactation, the parity of Nili-Ravi buffaloes has no effect on the PPIC (Shafiq and Usmani, 1996). Data of the present study, however, indicated that older buffaloes which are in seventh or higher lactation are more efficient in terms of postpartum reproduction and fertility than the younger buffaloes. This observation is partially in agreement with the previous reports (Shah *et al*., 1989; Naqvi, 2000) where a negative correlation was found between parity order and the PPIC or service period of Nili-Ravi buffaloes. One of the possible explanation of this better reproductive efficiency of older buffaloes could be the practice of retaining (after 5th or 6th lactation) only those buffaloes at the farm which are regular breeders and have optimum length of calving interval. In the present study, buffaloes calving during the month of September had the shortest interval to next conception. These buffaloes had the shortest PPIE, second highest FSCR (after August) and required lowest number of SPC, thus showing maximum efficiency in terms of postpartum estrous activity and fertility. Based on monthly frequency of calvings, the peak calving season began in July and ended in September. The PPIE and PPIC were comparatively longer (although non-significant) for buffaloes which calved during initiation of peak calving season (July) than those calving towards the termination or final stage (September) of the peak calving season. Almost similar inference was drawn by Chaudhry *et al*. (1990) who recorded shortest PPIC for buffaloes calving during August. Findings of the present study and that of Chaudhry *et al*. (1990) therefore, do not confirm the previous report of Ahmad *et al*. (1981) who documented that Nili-Ravi buffaloes calving during the month of June i.e. before the onset of peak calving season had the shortest service period.

Within peak calving season, the effects of month of calving on postpartum fertility of buffaloes should be carefully interpreted because such effects are confounded with that of month of breeding. Buffaloes cal ving during July had PPIE equal to 83.6 days and were bred during October, Buffaloes calving during August had PPIE equal to 60.8 days and were also bred during October. Similarly, the buffaloes calving during September had PPIE equal to 43.7 days which resulted in their breeding during end of October or beginning of November. In the light of these observations, it can be safely hypothesized that regardless of the month of peak calving season, buffaloes tend to express peak breeding activity during the months of October and November, when the chances of fertilization or fertility rate at first service is better than the average FSCR. In the present study, buffaloes calving during the months of February to May had the longest PPIE and required maximum number of SPC which lead to very long PPIC. These observations are of considerable practical significance for the managers of buffalo farms. While making the optional decision of shifting the calving season of some selected buffaloes in order to minimize seasonal fluctuations in milk production at the farm, the calving should not be synchronized to occur during the period from February to May. Instead, breeding activity of these selected buffaloes should be synchronized in such a way that they calve during the months of October to December. This suggestion is based on the observation of present study and several previous reports (Ahmad *et al*., 1981; Shah *et al*., 1989) that the buffaloes calving during October, November and December (late autumn and early winter) show better postpartum reproductive efficiency and fertility than those calving during late winter, spring and summer seasons.

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