Egyptian J. Anim. Prod. 35, Suppl. Issue, Dec. (1998):533-54

EFFECT OF BULL EXPOSURE SYSTEM ON POST-PARTUM REPRODUCTIVE PERFORMANCE OF HOT SEASON BUFFALO CALVERS

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SUMMARY

Twenty-four buffalo cows of hot season calvers were randomly assigned to three equal groups (G1,G2, & G3, n=8) subjected to different systems of bull exposure to stimulate post-partum ovarian and estrous activities. Cows of G1 were exposed to teaser bull twice daily, while those of G2 were continuously exposed to teaser bull throughout the experimental period which lasted up to day 90 post-calving. Animals of G3 were not exposed to bull as control. Animals of all groups were observed visually for estrous signs three times daily. Reproductive tract was palpated weekly to determine the time of uterine involution and blood samples were collected every 3 - 4 days for progesterone determination to monitor ovarian activity.

Introducing bull to female buffalo twice daily (G1) resulted in better ovarian and estrous activities compared to the other two groups.The recorded average number of ovulation and estrus/cow was 1.3, 0.9 & 0.9 and 0.8, 0.5 & 0.0 for G1, G2 and G3, respectively. The time elapsed to complete uterine involution and first ovulation was insignificantly different among the three studied groups. All the detected ovulations in non bull exposure group (G3) were quiet and the only observed heat was false. Bull exposure (G1 and G2) had an obvious effect on the regularity of ovarian activity. The percentage of regular ovarian pattern was 37.5 and 25.0 % for G1 and G2, respectively vs. 12.5% for G3 . Percentage of irregular ovarian activity was 62.5% for G3 vs. 37.5% for G1 and G2. .

Keywords: Buffalo, bull exposure, reproductive performance, post-partum, hot season

INTRODUCTION

Introducing male to females in post-partum period is frequently used to enhance the resumption of ovarian and estrous activities in most of farm

animals. Previous work on goats (Shelton,1960), sheep (Martin *et al.*,1980; Oldham & Pearce,1983 and Barkawi *et al* .,1990), beef cattle (Monje *et al.*,1992 and Fernandez *et al.*,1993) and dairy cattle (Ebert *et al.*, 1972) reported shorter post-partum ovulation interval for the exposed than the non-exposed animals. Introducing male evokes the secretion of LH in the exposed females (Martin *et al.*,1980) and consequently stimulates the ovarian function similarly to that obtained by hormonal manipulation (Aboul-Ela *et al.*, 1985 and Barkawi *et al* .,1995).

Most of the previous studies on Egyptian buffaloes reported long calving interval of>15 months (Mostageer *et al.*, 1981 and Metry *et al.*,1994) particularly for those calving in summer season. This is primarily attributed to the delay resumption of ovarian activity to 2-3 months (Mohamed and El-Sheikh, 1983) and/or the high frequency of quiet ovulation (Khattab *et al* ., 1990) due to the low level of circulating estradiol (Shafie *et al.*, 1982). Accordingly many trails were conducted to shorten the calving interval, through increasing the frequency of heat detection (Barkawi *et al* ., 1998) or hormonal treatment (Aboul- Ela *et al* ., 1985). Meanwhile, only few studies gave particular attention to the use of bull for stimulating the ovarian activity of buffaloes (Zicarelli *et al.*, 1991 and Mokhless *et al* ., 1995). The primary results of these works indicate that bull introduction may have a significant effect on shortening the interval from parturition to the first detected ovulation and estrus .

On the other hand, no data are available concerning the effect of bull exposure on the regularity of ovarian function as well as the best system of bull introduction of buffaloes which are the objectives of this study.

MATERIALS AND METHODS

1-Experimental animals and management

A total of 24 multiparous Egyptian buffalo cows between the 3*rd* and 8*th* parity that calved during May-June belonging to Mehalet Mousa Research Station, Animal Production Research Institute, Ministry of Agriculture were randomly assigned by calving date to three equal groups (n=8). Dams were allowed to nurse their calves for 7 days post-calving ; thenafter they were hand milked twice daily at 7:00 and 15:00 h . Animals were fed on concentrate mixture, berseem (*Trifolium alexandrinum*) hay and rice straw according to their live body weight and milk production level . Differences in milk production throughout the experimental period (90 days post-partum) among the studied groups were insignificant. The three groups were kept separately in semi-shed open yards.

2-Experimental procedure

Starting from the 7*th* day post-partum and throughout the experimental period, cows of the first group (G1) were subjected to twice daily bull

exposure regime (30 min / round) at 08:00 and 16:00 h. Bull was allowed to run with the cows of the second group (G2) continuously (24 h) as a full time bull exposure. Meanwhile, cows of the third group (G3) were not exposed to the bull as a control. Animals of the three groups were checked visually three times daily at 06:00, 12:00 and 18:00 h for 30 min/round. Bellowing, tail raising, restlessness, and vaginal mucus discharge were considered the main signs to recognize cows on heat. The mutual behaviour between the bull and femals was not considered as heat signs.

Blood samples were collected regularly every 3 to 4 days intervals starting 7 days post-partum up to the end of the experiment. After collection samples were kept in ice box before being centrifuged at 3000 rpm . Serum was harvested and stored at -20°C until the time of progesterone (P_4) determination. Ready coated antibody tube kits (Diagnostic Systems Laboratories, Texas, USA) were used for P_4 determination according to the procedure outlined by the manufacturer. The cross reaction of P_4 antibody was reported to be 100% with P_4 and <0.1 ng/ml with each of the other steroids. The standard curve ranged between 0.0 and 60. ng/ml and sensitivity value was reported to be 0.12 ng/ml. The intra and inter assay coefficients of variation were found to be 8.0 and 13.1 %, respectively .

3- Reproductive measurements

The reproductive tract was weekly palpated to monitor time of uterine involution. Animals which showed complete uterine involution were excluded from the rectal palpation routine. The interval from parturition to : the complete morphological uterine involution (UIP), first ovulation (PPOI) and first ovulatory estrus (PPEI) were recorded. Ovulation date was determined as the day of estrus if the heat sign (s) was followed by an increase in serum P_4 level to > 1.0 ng/ml and continued at that level for at least 2 consecutive samples. In quiet ovulation cases, date of ovulation was determined by subtracting 3 days from the date at which P_4 level reached > 1.0 ng/ml and continued at that level for 2 successive samples, at least. False estrus was identified if one or more of estrous signs were obsereved, however P_4 level remained <1.0 ng/ml throughout the next 7 days . Estrous or ovulation cycles were estimated as the period between two consecutive heats or ovulations , respectively. Estrous or ovulation cycles were divided, according to its length into short (<18 days), normal (18-24 days) or long (>24 days). Buffalo was considered to have regular ovarian activity if she had ovulated at least twice throughout the 90 days post-partum provided that the interval between the two ovulations was equal to the normal cycle. Animals were considered having sustained anestrus, if P_4 concentration remained <0.1 ng/ml throughout the experimental period regardless the short lasting P_4 spikes (≥1.0 ng/ml). Animals were considered having irregular ovarian activity when they either had one ovulation throughout the experimental period or showed long period of anestrus (> 3

week) after decrease of P_4 to the basel level following luteal phase that occurred after ovulation. Types of irregularity were recorded for each group.

4-Statistical analysis

Statistical analysis was performed applying SAS program (1985) , to test the significance of differences among group means of the studied traits .

RESULTS

1- Post-partum reproductive traits

Exposing females to males had no significant effect on each of UIP and PPOI .The exposed groups to the teaser bull (G1 and G2) and the non-exposed one (G3) had almost similar means for these two traits (Table 1) .

Table 1. Post-partum reproductive traits of the Egyptian buffaloes as affected by bull exposur

Group	UIP	PPOI	PPEI
G1			
Range	24-39	19-48	19-84
Mean ± S.E	31.0 ± 1.7[a]	39.8 ± 4.4[a]	47.8 ± 10.5[a]
Ratio	8/8	6/8	5/8
G2			
Range	24-33	19-48	34-48
Mean ± S.E	29.9 ±1.3[a]	32.0 ± 5.4[a]	41.0± 4.0[a]
Ratio	8/8	5/8	3/8
G3			
Range	24-39	21-51	0
Mean ±S.E	31.4± 1.6[a]	36.6± 4.8[a]	0
Ratio	8/8	6/8	0/8

(a,b) Means followed by different letters within each column differ significantly at 5% level.

G1: cows exposed to the bull twice daily, G2: cows continuously exposed to the bull, G3: control group.

Effect of bull exposure was clearly pronounced on the estrous activity . All detected ovulations in G3 were quiet and the only observed heat was false (Table 2). The recorded average of the post-partum ovulatory estrus (PPEI) was insignificantly shorter in G2 than in G1 (Table 1). This mean is misleading since, the ratio of cows that showed ovulatory estrus accompanying the first ovulation was higher in G1 than G2 (Table 1 and Figure 1).

Table 2. Post-partum ovarian and estrous activities

Groups	Total ovulations	Quiet ovulation	False estrus	Ovulatory estrus
G 1				
No of cases	10	4	2	6
Range	0-2	0-2	0-1	0-2
Mean ±S.E	1.3±0.3[a]	0.5±0.3[b]	0.3±0.2[a]	0.8±0.3[a]
G2				
No of cases	7	3	6	4
Range	0-2	0-1	0-2	0-2
Mean±S.E	0.9±0.3[a]	0.4±0.2[b]	0.8±0.4[b]	0.5±0.3[b]
G3				
No of cases	7	7	1	o
Range	0-2	0-2	0-1	o
Mean±S.E	0.9±0.2[a]	0.9±0.2[a]	0.1±0.1[a]	o

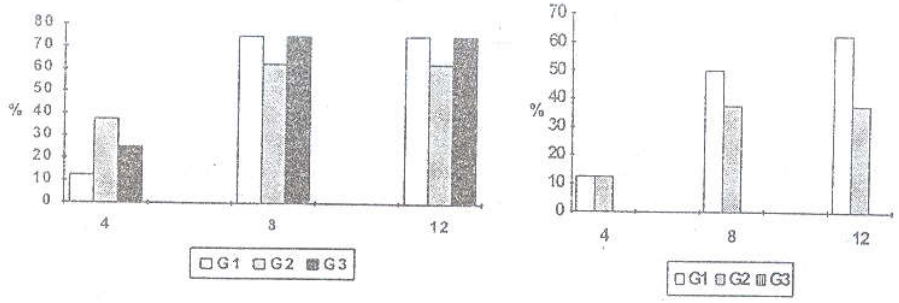
(a,b) Means followed by different letters within each column differ significantly at 5% level.

G1: cows exposed to the bull twice daily, G2: cows continuously exposed to the bull, G3 : control group.

2- Ovarian and estrous activities

Buffaloes exposed to bull twice daily (G1) showed better ovarian and estrous activities than the other two groups. This was clearly in the recorded average numbers of ovulation and ovulatory estrus / cow (Table 2) .

The interesting point to be noticed is that the cows which were continuously exposed to the bull (G2) showed higher average of false estrus, while those of G3 (control) showed the higher average of quiet ovulation. Throughout the experimental period, however, 75%, 62.5% and 75% of buffaloes in G1, G2 and G3 ,respectively, resumed their ovarian activity within the first 90 days post-partum, the corresponding percentages of estrous activity were 63%, 38% and 0.0 for G1, G2 and G3 , respectively (Figure 1).



a. Ovarian activity b. Estrous activity

Figure 1. Cumulative distribution (%) of cows that initiated ovarian (a) and estrous (b) activities during the first 90 days post-partum.

3- Regularity of ovarian activity

Bull introduction during the post-partum period had a clear effect on the regularity of ovarian activity (Table 3). Cows exposed to bull (G1 & G2) showed better regular pattern of ovarian cyclicity vs. the non-exposed group (G3). Serum P_4 profiles in some of regular (A), irregular (B) ovarian activity and sustained anestrus (C) in G1, G2 and G3 are shown in figure (2).

Table 3. Ovarian cycles per cow , percentage of regular and irregular ovarian activities and sustained anestrus as affected by bull exposure

Group	Ovarian cycle/ cow *	Regular ovarian activity	Irregular ovarian activity	Sustained anestrous
G1	1.3	37.5	37.5	25.0
G2	0.9	25.0	37.5	37.5
G3	0.9	12.5	62.5	25.0

* Calculated from 8 animals / group.

DISCUSSION

The absence of effect of bull exposure on PPOI and ratio of buffaloes that resumed ovarian activity within the first 90 days post-partum obtained in the present study is in contrast with the findings of Custer *et al.* (1990) , Zicarelli *et al.* (1991), Fernandez *et al* . (1993) and Mokhless *et al.* (1995). This may be due either to the small number of buffaloes in each group (n=8) and/or the negative effect of summer condition on the pituitary function (Aboul-Ela and Barkawi, 1988) which is expected to be enhanced with exposure to bull.

Mechanism (s) of male influence was reported to be mainly due to the effect of male pheromones on the endogenous female hormonal balance , particularly LH pulsatile release. Oldham and Pearce (1983) reported an increase in the frequency of LH pulses of ewes after ram introduction however, Custer *et al.* (1990) in beef cattle reported that bull did not alter the pattern of LH release. This contradiction trend indicates that the hormonal response to male exposure may vary among species. Accordingly, particular attention has to be paid to determine such response in the buffalo.

Effect of bull exposure on estrous activities is consistent with the findings of Custer *et al.*(1990), Zicarelli *et al.* (1991) , Fernandez *et al.* (1993) and Mokhless *et al* .(1995). The high incidence of false estrus in G2 or ovulatory estrus in G1 vs. G3, may be attributed to the effect of male pheromone on the females' central nervous system (Aron, 1979). The mode of action through which the male stimulates the false estrus is not clear so far.

Exposing females to male twice daily resulted in better response than that observed for those exposed continuously to the male. This was very clear in the ratio of responding animals, number of ovulations/cow, number of ovulatory estrus/cow and percentage of regular ovarian cycle. This effect may be due to the continuous presence of bull which might have resulted in a

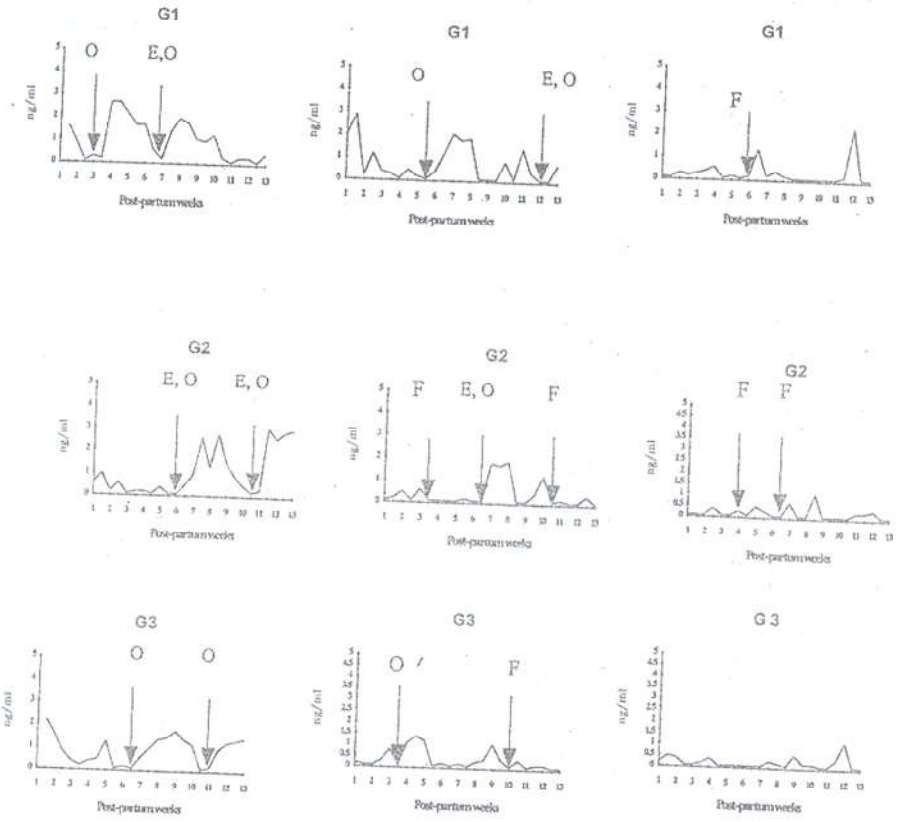


Fig. 2. Changes in serum progesterone concentration (ng/ml) during the first 90 days post-partum in regular ovarian activity (A), irregular ovarian activity (B) and sustained anestrous (C) buffaloes. Arrows and letters indicate ovulation (O), estrus (E) and false estrus (F).

refractoriness or decrease in the mutual interaction between males and females and consequently low response to the male presence.

In conclusion, system of exposing the females in post-partum period to the bull twice daily seems to be more beneficial to overcome the high frequency of quiet ovulation in summer season (El-Wardani,1990 and Barkawi *et al.*,1996) and to obtain better post-partum reproductive performance. However, further studies are needed to clearify the effect of buffalo bull on the endogenous female's endocrine system and on the behavioural responses of females.

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تأثير نظم تعرض إناث الجاموس للطلوقة فى فترة ما بعد الولادة على الأداء التناسلى فى الموسم الحار

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أستخدمت فى هذه الدراسة أربعة وعشرون جاموسة أختيرت عشوائيا وقسمت إلى ثلاثة مجموعات متساوية. وضعت هذه الحيوانات تحت ثلاثة أنظمة مختلفة للتعرض للطلوقة وذلك لتنبيه النشاط المبيضى والشبقى بعد الولادة فى الموسم الحار. تعرضت حيوانات المجموعة الاولى للطلوقة مرتان يومياً، بينما تعرضت المجموعة الثانية باستمرار للطلوقة طوال فترة التجربة التى أمتدت حتى اليوم ٩٠ من الولادة. كانت حيوانات المجموعة الاولى والثانية بالإضافة إلى المجموعة الثالثة والتى لم تعرض للطلوقة كمجموعة مقارنة تراقب بالنظر لإكتشاف الشياع ٣ مرات يوميا ، كما تم فحص الجهاز التناسلى للحيوانات أسبوعيا لتحديد وقت عودة الرحم لحالته الطبيعية . وجمعت عينات الدم مرة كل ٣-٤ يوم لتقدير مستوى هرمون البروجستيرون كوسيلة لتحديد ومتابعة النشاط المبيضى.

أدى تعريض إناث الجاموس للطلوقة مرتان يوميا (المجموعة الاولى) الى تحسن النشاط المبيضى والشبقى مقارنة بالمجموعتين الآخرتين. كان متوسط التبويض والشياع لكل حيوان ١,٣ ، ٠,٩، ٠,٨ وكذلك ٠,٨ ، ٠,٥، صفر للمجموعة الاولى والثانية والثالثة على التوالى. كانت الإختلافات غير معنوية بين جميع المجموعات فى الوقت اللازم لعودة الرحم لحالته الطبيعية وحدوث التبويض الاول. كانت جميع التبويضات فى المجموعة الثالثة بدون علامات شياع وكان الشياع الوحيد الملاحظ فى هذه المجموعة غير حقيقى. وكان التعرض للطلوقة فى المجموعة الاولى والثانية تأثير على إنتظام النشاط المبيضى. وكان نسبة النشاط المبيضى المنتظم ٣٧,٥ و٢٥٪ للمجموعة الاولى والثانية على التوالى مقابل ١٢,٥٪ للمجموعة الثالثة الغير معرضة للطلوقة. وكان النشاط المبيضى الغير منتظم ٦٢,٥٪ للمجموعة الثالثة الغير معرضة للطلوقة مقابل ٣٧,٥٪ للمجموعة الاولى والثانية المعرضة للطلوقة.