

## POST-PARTUM REPRODUCTIVE PERFORMANCE OF SUCKLING EGYPTIAN NATIVE (BALADI) CATTLE

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### SUMMARY

A total of 17 suckling native Baladi cows were used to characterize their post-partum reproductive performance during the days open period, with particular emphasis on season of calving. The calendar year was divided into two main seasons, cold (from November to April) and hot (from May to October). Cows were checked visually for heat three times daily, at 8 hr intervals starting at 05:00 hr in a presence of a vasectomized teaser. Standing behavior was considered the main sign of heat even when it was not accompanied by other estrous symptoms. Cows were mated naturally as soon as they showed their first heat. Genitalia were palpated weekly to determine the date of uterine involution (UIP). Blood progesterone concentration was determined twice a week for monitoring ovarian activity. The interval from parturition to the first ovulation (PPOI), estrus (PPEI), fertile service (DO) and next calving (CI) were estimated as well as the number of services required for conception (NS/C) and conception rate (CR %). Estrous signs were classified into weak, moderate and strong according to the number of heat signs that a cow displayed. Heat period (the interval from the start to the end of the heat period) was also recorded.

Results indicated that season of calving had no effect on all the studied parameters. Means of UIP, PPOI, PPEI, DO and CI were 28.8, 45.0, 55.3, 70.8 and 359.0 days, respectively. Number of services per conception was 1.3 in both seasons, with a higher conception rate in the cold (87.5%) than in the hot (66.7 %) season.

Quiet ovulation incidence represented one third of the total ovulations. The average length of the heat period was found to be less than 10 hours, with a relatively longer period in the cold season. The length of the heat period increased with ovulation repetition, as it was longer in the second heat than in the first one. Heat intensity was moderate on average, however the percentage of pronounced heat cases (strong and moderate) was higher in the hot (88.6 %) than in the cold (60%) season.

**Keywords:** Egyptian native cattle (Baladi), post-partum, reproductive performance

### INTRODUCTION

Conservation of genetic resources is of global interest if we are to save endangered breeds and to get the benefits of their inherited genetic merit for thriving

in a particular habitat. Moreover, it is of high priority in many places to maintain animals as purebreds for use in mating plans.

Baladi cattle (the native breed in Egypt) represent 37% of the total population of dairy breeds. They contribute 17% of the total milk production in Egypt. However, these cattle have a low milk production potential (640 - 1175 kg/ lactation, Mostageer *et al.*, 1987 and 1990).

Reproductive performance, in general and during post-partum period in particular, is of importance due to its effect on propagation of the herd and productive life. In addition, its study provides knowledge necessary for controlling the reproductive process. Nevertheless, most of the available information concerning Baladi cattle was extracted either from record analysis or questionnaires (Morsy *et al.*, 1984 and Nigm *et al.*, 1986), but rarely from experimental exploration (El-Gaafrawy *et al.*, 2000).

The effect of season of calving on post-partum reproductive performance was intensively studied on exotic dairy breeds under Egyptian conditions (El-Keraby and Aboul-Ela, 1982 and Swiefy, 1997), but such studies on Baladi cattle are lacking.

The present study was planned to investigate the post-partum ovarian and estrous activities and the parameters of reproductive efficiency of Baladi cattle with particular reference to season of calving.

## MATERIALS AND METHODS

### *Experimental Animals and Management*

A total of 17 Egyptian native (Baladi) cows between the 2<sup>nd</sup> and 5<sup>th</sup> parity were used in this study, which extended from parturition to the next conception. The cows were housed loose in a semi-shaded open yard and were fed according to the cow's live body weight and milk production level. Calves were allowed to suckle their dams during the experiment, while milk production was tested once monthly to calculate the nutritional requirements.

According to climate characteristics (Table 1), the calendar year was divided into two main seasons, cold (from November to April) and hot (from May to October). Cows were fed on concentrate mixture, rice straw and Egyptian clover (*Trifolium alexandrinum*) during the cold season, while the clover was replaced by its hay during the hot season.

**Table 1. Overall mean ( $\pm$ S.E) of ambient temperature ( $^{\circ}$ C) and day-light length (hr) throughout the experimental periods**

Item	Season	
	Cold	Hot
Ambient Temperature		
Range	2.0 - 29.0	8.0 - 38.0
Average	13.8 $\pm$ 0.9	22.5 $\pm$ 0.8
Day-light length		
Range	$\leq$ 12	>12
Average	11.3 $\pm$ 0.4	13.2 $\pm$ 0.3

### ***Experimental Design and Procedure***

Cows were divided into two groups according to their season of calving. Cows of the cold (n= 8) and hot (n= 9) seasons did not differ significantly in their average body weight and parity. Cows were checked visually for heat three times daily at 05:00, 13:00 and 21:00 hr using a vasectomized teaser. The teaser was allowed to run with the cows for 30 min during each heat detection period. Heat symptoms were divided into four classes: morphological changes in external genitalia, female self-behavior pattern, mutual behavior between females and mutual behavior with bull. Each class expressed signs of heat as presented in Table 3. However, standing behavior was considered the main sign of heat.

The reproductive genitalia were palpated weekly starting two weeks post-partum to determine the date of complete uterine involution.

Cows were mated naturally as soon as they showed their first heat, provided that the uterus was diagnosed as completely involuted.

### ***Blood Sampling and Hormonal Assay***

Blood samples were collected at 3-4 day intervals starting two weeks post-calving to determine the blood concentration of progesterone ( $P_4$ ) for monitoring ovarian activity. Blood sampling was continued until cows were diagnosed pregnant. Samples (5 ml) were collected from the jugular vein and centrifuged for serum harvesting at 3000 rpm for 15 min. Thereafter, samples were stored at  $-20^{\circ}\text{C}$  until they were assayed.

A radio-immunoassay technique was performed for  $P_4$  determination using ready-coated antibody tube kits (Spectra Orion Diagnosis, Espoo, Finland). The cross reaction of the progesterone antibody was 100% with progesterone and less than 1% with each of the other steroids. The standard curve ranged between 0.0 and 20 ng/ml. The sensitivity value was reported to be 0.06 ng/ml. The intra and inter assay variation coefficients were 6.4 and 7.5%, respectively.

### ***Post-Partum Reproductive Parameters***

The interval from parturition to each of: uterine involution (UIP), first ovulation (PPOI), first estrus (PPEI), fertile service (days open, DO) and next calving (CI) were determined. The number of services required for conception (NS/C) and conception rate (CR %, calculated as the percentage of cows that conceived after the first service), were also calculated.

In quiet ovulation cases, date of ovulation was determined by subtracting three days from the day at which the  $P_4$  level reached  $\geq 1.0$  ng/ml and continued at that level for at least three consecutive samples. In ovulatory estrous cases, the day of heat was considered the day of ovulation, provided that the  $P_4$  level increased to reach  $\geq 1.0$  ng/ml and continued at that level for at least three consecutive samples within the next seven days. If  $P_4$  did not increase to the determined level for ovulation, the heat was considered false.

The length of the heat period was estimated using the standing estrous cases. Heat duration was calculated as the period between the beginning and termination of standing behavior. The time of onset of heat was determined by subtracting four hours from the time at which the cow showed her standing behavior. Termination time of the heat period was determined by subtracting four hours from the first time the cow refused to stand quietly to be mounted. Heat was considered strong,

moderate or weak when standing behavior was accompanied by at least three other symptoms (e.g. mounting others, bellowing, vaginal mucous discharge or restlessness), two other symptoms or one symptom, respectively.

#### Statistical Analysis

One-way analysis was done for data analysis using the SAS program (1995). The model included one fixed factor, season of calving, as follows:

$$Y = \mu + S_i + e_{ij}$$

Where Y= the least square average of the studied traits

$\mu$  = overall mean

$S_i$  = Season of calving (S=1, 2)

$e_{ij}$  = experimental error

## RESULTS AND DISCUSSION

Baladi cows completed their uterine involution within four weeks and resumed their ovarian and estrous activities within 60 days post-partum (Table 2). The overall means obtained for UIP, PPOI, PPEI and DO were relatively longer than those found by El-Gaafrawy *et al.* (2000). These differences may be due to the fact that the authors conducted their experiment during the summer, which had short intervals similar to those obtained in the hot season of the present study, and /or to the inhibitory effect of suckling on the reproductive performance as applied in the present study.

**Table 2. Least square means ( $\pm$ S.E.) of post-partum reproductive characteristics of suckling Baladi cows**

Trait	Season		Overall mean
	Cold	Hot	
Number of cows	8	9	17
Uterine involution period (d)	26.9 $\pm$ 1.8	30.6 $\pm$ 1.6	28.8 $\pm$ 1.2
Post-partum ovulation interval (d)	49.9 $\pm$ 10.4	40.7 $\pm$ 11.3	45.0 $\pm$ 7.6
Post-partum estrous interval (d)	62.6 $\pm$ 13.4	48.8 $\pm$ 8.3	55.3 $\pm$ 7.6
Days open (d)	73.4 $\pm$ 13.6	68.4 $\pm$ 12.5	70.8 $\pm$ 8.9
Calving interval (d)	365.4 $\pm$ 13.6	353.3 $\pm$ 11.6	359.0 $\pm$ 8.6
Number of services / conception	1.3 $\pm$ 0.3	1.3 $\pm$ 0.2	1.3 $\pm$ 0.3
Conception rate (%)	87.5	66.7	76.5
Heat period (hrs)	10.0 $\pm$ 1.3	8.9 $\pm$ 0.9	9.4 $\pm$ 0.8

A point of interest is that the number of services per conception (1.3) in this study is lower than in the previous reports on Baladi (1.8- 2.6, Morsy *et al.*, 1984 & 1986) and Friesian cattle (2.0, Sweify, 1997) under the prevailing Egyptian environmental conditions. The higher number of services per conception in Friesian cattle can most probably be attributed to their high milk yield in comparison with Egyptian Baladi cattle. The low number in the present work may also be due to the applied regime of heat detection (4 times daily), which was able to recognize cows in estrus and inseminate them at the proper time.

The low number of services per conception had a positive impact on the conception rate (76.5 %), which resulted in a short days open and calving interval (359 days) (Table 2). It appears therefore that Baladi cows could be bred to calve once a year, even under a nursing system. The calving interval reported here is less than that reported by Oloufa (1968) and Morsy *et al.* (1984) for Baladi cattle (381-401 days) and for Friesian cattle in Egypt by Ragab *et al.* (1973), El-Menoufy *et al.* (1984), Mahmoud (1989) and El-Ashram (1993) (378.8 - 472 days).

Season of calving had no effect on all the studied traits. Most parameters studied, except conception rate and heat period (Table 2), were lower for hot season calvers, however this seasonal difference was not statistically significant (PPOI, PPEI, DO, CI, CR and heat period). This may be due to the adaptability of Baladi cows (El-Gaafrawy *et al.*, 2000).

Ovulatory estrous cases represented 66.6% of the total detected ovulations in days open (Figure 1). The average number of ovulations per cow during days open was higher in the hot than in the cold season and the percentage of quiet ovulations (43.5%) was likewise higher during the hot than the cold season (21.1 %).

Average length of heat period, which accompanied the first ovulation, was less than 10 hours, with insignificantly longer periods in the cold season than that in the hot season. Heat period tended to increase in the second heat. This trend is in agreement with the findings of Swiefy (1997), however the overall mean of heat period is less than that of cattle in Egypt (13.6-16.0 hrs; Abdel Bary *et al.*, 1992 and Swiefy, 1997). It is interesting to note that 58% of the recorded heat cases (n= 24) in Baladi cattle in this study were 8 hrs long.

Heat intensity of Baladi cattle was generally moderate (about 49 %), however the percentage of the pronounced heat cases (strong and moderate) was higher in the hot (88.6 %) than in the cold season (60%) (Table 3). This is in agreement with the results of Zakai (1981) who reported poor estrous manifestation for Indian cattle during the cold season in Nigeria.

**Table 3. Estrous intensity (%) throughout days open of Baladi cows as affected by season of calving (n= 24 cases)**

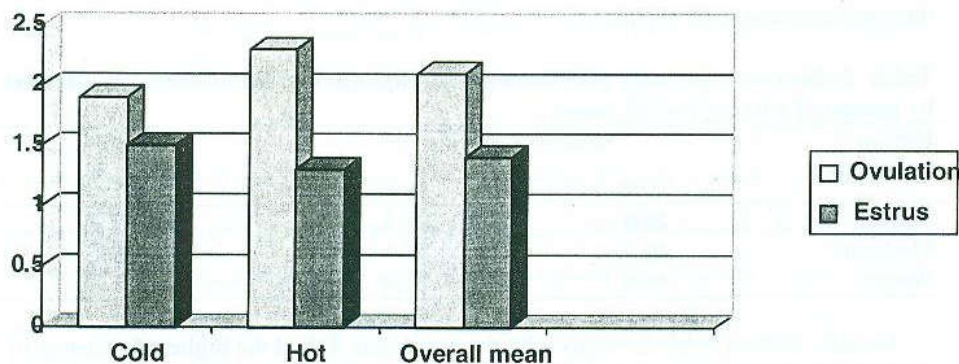
Estrous intensity	Season of calving		Overall
	Cold	Hot	
Strong	20.0	21.4	20.7
Moderate	40.0	57.1	48.6
Weak	40.0	21.4	30.7

Female mutual behavior signs with the bull (class 4) had the highest frequency of occurrence (100 %) compared to the other signs (Table 4). Bellowing and mounting behavior (class 2) exhibited the lowest frequency. Except of standing behavior, the other symptoms were unreliable. Heat signs were more frequent during the hot season of the year than in the cold season.

**Table 4. Sexual behavioral symptoms (%) during the heat period in relation to season of calving**

Heat symptoms	Season of calving		Total
	Cold	Hot	
Number of heat cases	10	14	24
<b>Class 1: Morphological changes in external genitalia</b>			
1. Vulva swelling	30.0	42.0	36.3
2. Vulva hyperemia	20.0	64.0	42.2
3. Vaginal mucous discharge	30.0	35.7	32.9
<b>Class 2: Female self behavioral pattern</b>			
4. Bellowing	20.0	28.6	24.3
5. Tail raising	30.0	50.0	40.0
6. Restlessness	40.0	57.1	48.6
<b>Class 3: Mutual behavior with bull</b>			
7. Mounted by other herd mates	20.0	28.6	24.3
8. Vulva sniffed by other herd mates	40.0	50.0	45.0
<b>Class 4: Mutual behavior between females</b>			
9. Followed by the bull	100	100	100
10. Standing behavior	100	100	100

In conclusion, Baladi cattle were shown to have a good, year-round reproductive potential. These merits may be due to the adaptability of Baladi cows to Egyptian conditions. Moreover, it appears that Baladi cattle could be bred to calve once a year, even under a natural nursing system, due to their high conception rate.



**Figure 1. Least squares means of ovulation and estrus per cow throughout the days open period**

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## الصفات التناسلية لمرحلة ما بعد الولادة في الأبقار المصرية البلدي المرضعة

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البحوث الزراعية - الدقى

استخدم في هذه الدراسة ١٧ بقرة بلدية حديثة الولادة لتقدير الصفات التناسلية لها في فترة ما بعد الولادة وحتى التلقيح المخصب. قسمت السنة إلى موسمين: بارد (من نوفمبر حتى إبريل) وحرار (من مايو حتى أكتوبر). خلال فترة الدراسة تمت مراقبة الأبقار بالعين المجردة ومع استخدام الذكر الكشاف ثلاث مرات يومياً (كل ٨ ساعات) لاكتشاف الشياح وذلك ابتداء من الساعة الخامسة صباحاً وقد أعتبر أن تقبل الأنثى للذكر هو المظهر الرئيسي للشياح حتى لو لم يصاحبه علامات شياح واضحة. تم تلقيح الأبقار طبيعياً بمجرد ظهور أول شياح لتقدير طول الفترة المفتوحة.

تم الفحص التناسلي أسبوعياً لتقدير الفترة اللازمة لعودة الرحم لوضعه الطبيعي، كما تم تقدير تركيز هرمون البروجسترون في الدم مرتين في الأسبوع لتحديد طبيعة النشاط المبيضي، وقد تم تقدير الفترة من الولادة وحتى التبويض الأول، والشياح الأول التلقيح المخصب كما تم تقدير عدد التلقيحات اللازمة لحدوث الحمل ومعدل الإخصاب. وقد تم توصيف حالات ظهور الشياح إلى حالات ضعيفة، متوسطة، قوية وذلك تبعاً لعدد مظاهر الشياح التي تظهر على الأبقار. وتم حساب فترة الشياح وهي الفترة من بداية إلى نهاية الشياح.

وقد أظهرت النتائج أن فصل الولادة لم يكن له تأثير معنوي على كل المقاييس موضوع الدراسة. كما كان المتوسط العام للفترة من الولادة وحتى عودة الرحم إلى وضعه الطبيعي، التبويض الأول، الشياح الأول، التلقيح المخصب و الفترة بين الولادتين ٢٨,٨، ٤٥، ٥٥,٣، ٧٠,٨، ٣٥٩ يوم على التوالي. أما عدد التلقيحات اللازمة لحدوث الحمل فكانت ١,٣ في كل من فصلى الدراسة مع ارتفاع نسبة معدل الإخصاب في الفصل البارد (٨٧,٥%) عن الفصل الحار (٦٦,٧%). وقد كانت نسبة التبويض الصامت حوالى ثلث العدد الكلى للتبويض وكان متوسط طول فترة الشياح في الأبقار البلدية أقل من ١٠ ساعات، مع ارتفاع نسبي في طول فترة الشياح أثناء الفصل البارد كما أظهرت النتائج أن فترة الشياح تطول مع تكرار التبويض حيث تكون أطول في الشياح الثاني مقارنة بالشياح الأول وكانت بشكل عام متوسطة. و إن كانت أقوى في الموسم الحار (٨٨,٦%) عن الموسم البارد (٦٠%).