

Physiological and Seasonal Factors Affecting Reproductive Performance of Egyptian Buffalo Heifers

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NINETY five Egyptian buffalo heifers, belonging to Mehallet Mousa Station, Ministry of Agriculture, were used in this investigation to study their reproductive performance. The major traits were fertility and conception and early embryonic mortality. Effect of age weight and season of the year on their reproductive parameters were investigated. Thirty four calving buffaloes were used during the period from January to April 1978 to study the changes occurring in the uterus after parturition, post-partum heat and ovulation.

The obtained results could be summarized as follows:—

- (1) The average age and weight at first service were 25.0 ± 0.04 months and 302.9 ± 0.2 kg respectively. The age and weight at first conception were 27.2 ± 0.3 months and 314.8 ± 0.3 kg.
 - The average interval from first service to fertile one in heifers that failed to conceive from the 1st service was 66.3 days.
 - It was found that 34% of total time loss from first to fertile service was due to the cases of early embryonic mortality, while the rest (66%) was mainly attributed to the cases of ovarian inactivity and non-conceived services.
- (2) The percentage of buffalo heifers that conceived from one, two, three and four services or more was 55.8, 27.4, 10.5 and 6.3% respectively.
 - The season of the year has an apparent effect on conception rate, being 77.3, 70.7, 69.2 and 22.2% of the females mated respectively in autumn, winter, spring and summer.
 - Number of service per conception was almost equal in autumn, winter and spring (1.53, 1.56 and 1.50), while it was extremely great in summer (2.5).
 - The conception rate increased and the number of service per conception decreased with the increase in age and body weight.
- (3) The average period from parturition to restore the normal uterine condition (uterine involution period) was 34.7 ± 1.5 days ranging between 19 and 57 days.
 - The average period from parturition to the first observed heat was 43.9 ± 4.4 days, ranging between 18 and 161 days, while the average period to the first ovulation was 28.0 ± 1.4 days, ranging between 16 and 47 days.

Many Egyptian investigators have studied the reproductive efficiency of Egyptian Buffaloes, nevertheless there are clear discrepancy in their results. Contraversal results reported by different authors are due to the multiplicity of factors affecting conception rate and fertility other than the potential reproductive efficiency of the animal.

As reviewed by Hafez (1955), El-Fouly (1966), El-Nouty (1971), the age and weight of Egyptian Buffalo heifers at first service and at first conception range between 21-23.6 and 21.5-32.7 months respectively.

Results obtained by different authors concerning the number of services per conception show wide variability. For example Hafez (1952) reported the mean number of services per conception to be 1.5. The same author in (1955) found it to be 4.25 in the average, while Ragab *et al.* (1956) in the same herd found it 1.51. Mohamed (1974) stated an average of 2.2. Recently Mostageer *et al.* (1981) reported a mean of 1.6 doses/Conception for Egyptian Buffalo cows, in a herd of 210 buffalo cows. In Indian Buffaloes the average number of services per conception was 1.74-1.4 (Sing and Dutt, 1964 and Eaizada and Panday, 1972).

Irregular ovarian functions and estrous cases and feeding plans of nutrition are the main factors responsible of elongation of the time loss from first to fertile service, (El-Sheikh, 1967 and El-Nouty, 1971). The same authors reported that the average time lost from first to fertile service was 2.8, 2.3 and 3.3 months under high, normal and low feeding planes of nutrition respectively. Some investigators believe that early embryonic mortality is one of factors causing elongation of time loss from first service to successful conception (El-Sheikh and El-Fouly, 1971).

From the results obtained by different investigators concerning conception rate and factors affecting fertility in buffaloes, it could be concluded that the conception percentage is between 72-75 (El-Fouly *et al.*, 1976 and Mohamed, 1965). High air temperature, long day light and low humidity and lack of green feeders are the main reasons for low percentage of successful matings (Badreldin, 1952 and El-Fouly *et al.*, 1976).

Most investigators agree that the highest percentage of pregnancy and calving occur during the period from September to March for Egyptian Buffaloes and from June to December for Indian ones (El-Sheikh, 1967 and Rao and Murari, 1956).

After parturition the uterus of Egyptian Buffaloes needs a period of 35-41 days for complete involution and the first post-partum estrous begins 1-3 months later (El-Wishy, 1965; Elsobhy, 1975 and El-Sheikh and Mohamed 1977). The time required for complete involution in Indian Buffaloes was found to be 26-32 days (Gudi and Deshpande, 1977).

Material and Methods

This work was carried out at the Animal Production Research Station at Mehallet, Mousa, Ministry of Agriculture. Ninety five Egyptian Buffalo heifers born in the period from February 1975 to January 1976 were used in this study. Management, feeding and climatic conditions were executed as described before by Borady *et al.* (1982).

Natural mating was allowed at any time of the year for animals over 18 months of age and 285 kg of body weight.

Collection of data

I. Conception and pregnancies

The animals (95 heifers) were put under observation to study the following reproductive parameters :

1. The age and weight at first mating and at fertile service, the period lapse between them was computed as time loss.

2. Number of service per conception, which was determined by dividing total number of services on total number of animals conceived.

3. Fertility and conception rate, which was determined as the percentage of animals that conceived from first, second, third and the fourth service or more.

4. Embryonic mortality, which was estimated as a percentage of total number of pregnancies

5. Effect of season of the year on the above mentioned reproductive characters.

II. Post-partum reproductive activity

Uterine involution, post-partum heat and ovulation were studied on thirty four buffaloes calved between January to April 1978.

Involution of the uterus

The uterus was considered involuted when it returned to its normal location in the pelvic cavity and when its uterine horns attained approximately the pre-conception size, tone and persistency.

Post-partum heat and ovulation

The first post partum observed heat and palpable corpus luteum were recorded

During summer and Autumn, the animals were divided into mating groups (almost the same numbers). Each mating group was housed with a sire in open shed for two months. Within each mating group, the animals were observed by day for heat and the occurrence of actual services was recorded. After two months, the animals were checked for pregnancy. The nonpregnant animals were joined the next mating group with the same sire. The dates of services which were not observed (occurred by nights) resulted in pregnancy were estimated approximately by pregnancy diagnosis and dates of birth.

During winter and spring (when the animals were kept on pasture), all the animals were confined into one group, the sire joined the animals only in day time, and the services were recorded for each individual heifer on the spot. Heifers repeating heat were rebred by the same sire.

Two sires were used for natural mating in this study, their age was 4 years. Semen quality was evaluated by the standard semen tests and was found to be quite satisfactory, these sires were highly fertile as was indicated by their previous reproductive history.

Statistical assessment of the mean values in the data obtained was done after Snedecor and Cochran (1968).

Results and Discussion

I. Reproductive performance of buffalo heifers

(1) Age and weight at first mating

The overall average age at first mating for 95 heifers (all were served and conceived) was 25.0 ± 0.04 months and the range was between 18 and 37 months with an average weight of 302.9 ± 0.2 and range between 285 and 395 kg. (Table 1). This average of age is higher while the body weight is lighter than that reported by many investigators on Egyptian buffalo heifers (Ahmed and Tantawy, 1954; Ragab and Abdel-Salam, 1963; El-Fouly, 1966 and El-Nouty, 1971). Their values varied from 20.8 to 24 months of age and 331 to 666 body weight. The difference may be mainly due to the managerial practices of the breeding stock and system of feeding. Any attempt to decrease age at first service than 24 months is not effective without taking into consideration its corresponding live body weight, which can be accelerated through better feeding and care.

(2) Age and weight at first conception

The average age and weight at conception for the 95 buffalo heifers under investigation was 27.2 ± 0.7 months and 314.8 ± 0.3 kg (Table 1).

TABLE 1. Average age and body weight at first mating and fertile service and time loss.

No. of services	No. of animals	Percentage	Average body weight (kg) at		Average age (months) at		Time loss per animal
			1st mating	1st fertile service	1st mating	1st fertile service	
One	53	55.8	305.3±0.5	305.3±0.5	25.3±0.5	25.3±0.5	0.0
Two	26	27.4	304.2±4.0	320.9±4.4	25.0±0.03	27.8±1.1	2.8
Three	10	10.5	296.5±2.9	333.7±6.7	25.8±0.9	33.1±1.3	7.3
4 or more	6	6.3	289.8±2.5	337.2±7.6	21.3±1.5	31.8±1.9	10.6
Total & average	95	100	302.9±0.26	314.8±0.2	25.0±0.04	27.2±0.7	2.2

These values obtained in the present study are extremely higher than those obtained by Hafez (1955), and El-Nouty (1971). They reported respectively 21.5, 22.8 months of age and 319, 347.5 kg body weight. It can be concluded, theoretically that the differences may be due to one or more of the three following causes; 1) the small number of animals studied by these workers, 2) the high variations among the animals studied in the present work, particularly, that these animals were born in different seasons of the same year, and 3) delay in puberty and maturity age and weight according to season of calving. On the contrary the present values are lower than obtained by El-Fouly (1966) in Egyptian buffaloes and Singh and Dutt (1964) in Indian Murrah buffaloes. The greater age found by the first investigator (31.4 months) was attributed mainly to the causes involved in time loss from first to fertile service.

(3) Number of services per conception

Out of 95 heifers inseminated, 53 (55.8 %), 26 (27.4 %), 10 (10.5 %) and 6 (6.3 %) conceived from one, two, three and four or more services (Table 1).

The average number of services per conception was 1.71 ± 0.08 ranging between 1 and 5. This average is comparatively higher than that reported by Hafez (1952) and Ragab *et al.* (1956), (1.5 and 1.51 respectively). The present value is lower than that obtained by El-Fouly (1966) and Mohamed (1974) in Egyptian buffaloes (2.92 and 2.2), respectively. Mohamed attributed the high number of services required for conception to the non-ovulatory services which constituted 1.33 services from the total number of services required per conception, the remaining number of services (1.59) were associated with ovulation. The average obtained in the present study is almost equal to that obtained by Singh and Dutt (1964), and Shukla *et al.* (1970) in Murrah and Surti buffaloes in India (1.75 and 1.67 respectively).

(4) *Time loss from first mating to fertile service*

The average time loss per one heifer from first mating to fertile service was 2.21 months (approximately 66 days), for the total of animals included in this study (5 heifers) (Table 1).

The total time loss for 42 heifers failed to conceive from the first service was considerable 6270 days (approximately 99 days per one heifer) (Table 2). It was found that around 80 % and 20 % of the cases of conception failure from first service were due to infertile services and embryonic mortality. Table 2 shows that 66 % of time loss (4140 days) was due to both non-conceiving services and irregularity of ovarian function, the rest 34 %, was due to the embryonic mortality cases (12 cases).

TABLE 2. Causes of time loss from first mating to fertile service (for 42 heifers) which failed to conceive from the first service.

Causes of time loss	Cases		time loss (days)		% of total
	No	%	Sum	Per individual	
Infertile services and other cases	51	81	4140	81	66
Embryonic mortality	12	19	2130	178	34
Total	63	100	6270	99	100

The present average of time loss per one heifer out of the total animal studied was found to be approximately equal to the findings reported by Mohamed (1965) in Egyptian buffaloes (69.2 days). El-Nouty (1971) found that this time loss was 2.3 months per buffalo heifer under normal feeding plane. The time loss for heifers that failed to conceive from the first service was found to be very low in the present study (99 days) than that reported by El-Fouly (1966) and El-Sheikh (1967) for Egyptian buffalo heifers (252.6 days). These authors attributed that loss is mainly due to quiet ovulations, non-ovulatory heats and infertile services, (60.7 %, 12.9 % and 10.0 % of the total time lost respectively). These three estimates were however, higher (83.6 %) than that obtained in the present study (81.0 %).

II. Factors affecting reproductive system activity of buffalo heifers

1. Effect of age and body weight on conception rate and number of service per conception

The conception rate by the first service increased with age up to 24-29 months, after which it showed slight depression (47.5, 62.5 and 60.0% for age classes of 18-23, 24-29 and 30 months or more respectively) (Table 3). The total number of heifers conceived by one or more services increased with increasing age till 30 months or more (55.3, 72.2 and 83.3 for the age classes respectively).

The present findings also agree with the findings reported by Olds *et al.* (1952), that the fertility rate increased in Holstein and Jersey heifers with age, increasing up to 12 to 24 months.

The average number of services required per conception were 1.96, 1.72 and 1.46 respectively for the age groups of 18-23, 24-29 and 30 months or more (Table 3). It is clear that the first group required greater number of services per conception. Most investigators agree that maiden heifers require more services per conception than older animals in both buffaloes and cows in Egypt (Hafez, 1952; Oloufa, 1955 and Ragab *et al.* 1956). Body weight had a remarkable effect on the success of conception with positive relationship (Table 3). The number of services per conception decreased with the increase in body weight.

TABLE 3. Effect of age and body weight on conception rate and number of services per conception.

Classification	No. heifers	No. heifers conceived by 1st service	Percentage	Total heifers conceived	No. of services required	Total conception rate	No. services per conception
Age (months)							
18-23	40	19	47.5	26	53	55.3	1.96
24-29	40	25	62.5	39	62	72.2	1.72
30 or more	15	9	60.0	30	47	83.3	1.46
Body weight (kg)							
300 and less	61	32	52.5	37	75	56.1	2.03
over 300	4	21	61.8	58	87	81.7	1.50
Total and average	95	53	55.8	95	162	69.3	1.71

2 Effect of season on conception rate and number of service per conception

The percentage of heifers that conceived at first service was 60.0, 61.1, 55.6 and 12.5% respectively in autumn, winter, spring and summer seasons. The corresponding percentage of heifers conceiving from one or more services during these seasons was 77.3, 70.7, 69.2 and 22.2% (Table 4).

It was evident that autumn and winter (September-February) have the highest percent of conception, while spring was slightly low, but summer season has the lowest percent.

It should be noticed that generally the practice in Egypt is to mate buffaloes during winter to calf during late autumn and early winter, when the weather is mild and plenty of green fodder is available. El-Fouly (1966), El-Sheikh (1967) and Mohamed (1974) suggested that the low conception and fertility percentage of buffalo heifers particularly during summer months may be due to hormonal deficiency and disturbance in these animals during these months which may lead to the irregularity of reproduction and conception failure.

TABLE 4. Effect of season on conception rate and number of services per conception.

Season	No. of heifers received one service	No. of heifers conceived at 1st service	Percentage	Total heifers conceived	No. of services required	Total conception rate	No. of service per conception
Autumn	25	51	60.0	34	52	77.3	1.53
Winter	44	27	61.1	41	64	70.7	1.56
Spring	18	10	55.6	18	27	69.2	1.50
Summer	8	1	12.5	2	19	22.2	2.50
Total and average	95	53	55.8	95	162	69.3	1.71

The results obtained in the present study agree with Tamar (1966) who reported that months and season of insemination had a highly significant effect on conception rates in Hariara cows and Murrah buffaloes. Goswami and Nair (1965) and Roy *et al.* (1968) attributed the probable reasons for poor breeding in buffaloes during summer to high temperature, long day light,

low humidity and lack of green fodder. On the other hand, Shukla *et al.* (1970) and Grewal *et al.* (1974) reported that the season of the year was observed to have no significant influence on conception rate in Surti buffaloes and Haryana cows respectively, probably, the physical conditions, in this case, were similar.

There was no difference, in the number of services per conception, between Autumn, Winter and Spring (Table 4). Summer was unique in requiring almost double number to that of the other seasons. Singh and Dutt (1964) working on Murrah buffaloes and Grewal *et al.* (1974) working on Haryana cows agreed that the number of services required per conception is influenced by the month and season of insemination but the difference was not significant.

III- Post-partum reproductive activity

Involution of the uterus

In thirty four buffaloes the overall average interval from parturition to the uterine involution was found to be 34.7 ± 1.5 days. The range was between 19 and 57 days (Table 5). The modal length for uterine involution period was between 31 and 40 days which included 47% of the cases.

After parturition the two horns began to regress from the size attained at the time of parturition to almost that of the period preceding pregnancy. The contraction of the uterus begins after parturition and the tone improved gradually from a meaty condition to fair or normal palpable uterus. This volume of the vaginal discharge decreased with the advancement of the uterine involution till it disappeared completely. This volume of discharge varied from animal to another and was seen in only some of the buffaloes because observation was limited to the time of examination. Also the colour of discharge changed from brown to yellow or cloudy and then to ghlyary

TABLE 5. Frequency distribution of post-partum uterine involution, heat and ovulation periods in buffaloes.

Class interval (days)	Uterine involution period			Post partum heat period			Post partum ovulation period		
	N. of animals	days	%	N. of	days	%	N. of animal	days	%
30 or less	10	25.0 ± 1.3	29.4	6	24.3 ± 1.9	17.6	23	23.0 ± 0.7	67.6
31—40	16	34.6 ± 0.7	47.0	10	36.6 ± 1.0	29.4	7	35.3 ± 1.1	20.6
41—50	6	44.3 ± 1.1	17.7	14	$24. \pm 0.5$	41.2	4	43.5 ± 1.1	11.8
51 or more	2	34.0 ± 3.0	5.9	4	94.5 ± 13.0	11.8	—	—	—
Total	34	34.7 ± 1.5		34	43.9 ± 4.4		34	$28.0 \pm .4$	

The uterus was considered completely involuted when the horns attained approximately the normal size, tone and consistency of the gravid uterus, and returned back to their normal location in the pelvic cavity.

This overall average length of post-partum uterine involution in buffaloes (34.65 ± 1.51 days) is considerably the same as reported by El-Wishy (1965) in Egyptian buffaloes (35.0 days), while it was slightly shorter than the average reported by El-Sobhy (1975) and Mohamed (1974) in Egyptian buffaloes (37.9 and 40.7 days respectively) and Roy and Luktuke (1962) in Indian Murrah buffaloes (39.3 days). On the contrary the present average is greater than the average reported by Gudi and Deshpande (1977) in two herds of Indian buffaloes (26.42 and 21.85 days respectively).

Post-partum estrus and ovulation

In the same group of 34 buffaloes the first post-partum heat and ovulation was recorded.

The overall average interval from parturition to the first observed heat was 43.91 ± 4.37 days, and the range was between 18 and 161 days (Table 5). The modal length for the first post partum heat was between 41 and 50 days which included 41.18% of the cases studied.

The average post-partum heat length estimated in the present investigation is comparatively in the same range obtained by Hafez (1952 and 1954) and Oloufa (1955 and 1960) using selected experimental herd of Egyptian buffaloes (within 35-70 days) and slightly lower than obtained by Luktuke (1957), (50-60 days) for Indian, Murrah buffaloes calved during autumn and winter. There is great difference between the average post-partum heat period obtained in the present study and that obtained by Mohamed (1974) (147.37 ± 12.61 days) and El-Shaikh and Mohamed (1965) (136.5 days) in Egyptian buffaloes. The first investigator attributed this high value to the system of management followed in his experiment including the buffaloes that failed to show heat signs in the herd for the purpose of studying causes of post-partum infertility. On the contrary, all the buffaloes used in the present study calved during the period from January to April (late winter and early spring) and no abnormal calvings were observed, this may be the cause of getting short heat interval after parturition. Several investigators reported that the season of calving had a marked influence on length of post-partum heat interval (El-Sheikh and Mohamed, 1965; Mohamed, 1974; Luktuke, 1957 and Basu, 1962).

The overall average of post-partum ovulation interval was 27.97 ± 1.40 days, the range was between 16 to 47 days. The modal length ranged between 16 and 30 days which included 67.65% of the cases studied (Table 5).

Comparing the periods of post-partum heat and ovulation in the present study, it appears that the first post-partum heat interval was delayed approximately 16 days after the first post-partum ovulation. It appears that the first ovulation is quiet accompanied with silent heat, followed by normal ovulatory heat (Fig. 1).

The average interval from parturition to first ovulation in the present study is greatly shorter than that obtained by Mohamed(1974) and El-Sobhy (1975) for Egyptian buffaloes. Their findings were (108.5 and 69.3 days respectively). These differences may be due to the season of calving and the calving abnormalities. Mohamed (1974) found that the spring calvings had shorter periods of post-partum ovulation.

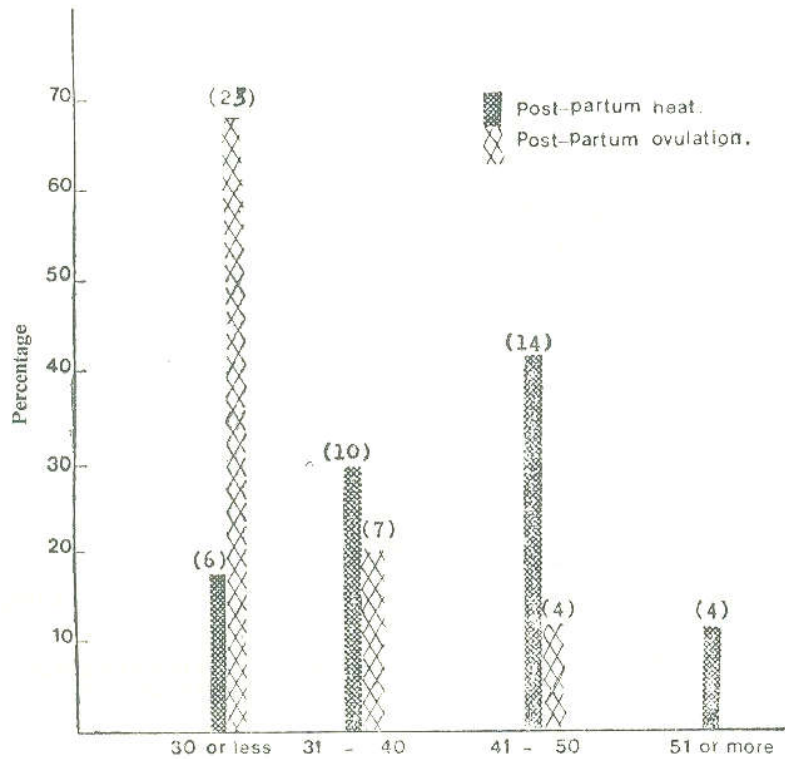


Fig. 1. Frequency distribution of post-Partum heat and ovulation periods.

() Number of animals.

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تأثير العوامل الفسيولوجية وفصول السنة على التلوهر التناسلية لعجلات الجاموس المصرى

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أجرى هذا البحث على ٩٥ عجلة جاموسى ضمن قطع الجاموس بمنطقة ميلة موسى التابعة لوزارة الزراعة • واستهدف البحث دراسة المظهر التناسلى لهذه العجلات وتأثير عمر الحيوان ووزنه وفصل السنة على معدل الخصب والتفوق المبكر للأجنة • ولدراسة التغيرات التى تحدث فى الرحم والبياض والتبويض بعد الولادة ، تم استخدام ٣٤ جاموسه تمت ولادتها فى الفترة من يناير الى ابريل ١٩٧٨ •

وتتلخص نتائج البحث فى الآتى :-

١ - كان متوسط العمر والوزن عند التلقيح الاول هو ٢٥٠ ± ٠٠٤ شهرا ، ٣٠٢٩ ± ٠٢ كيلوجرام على التوالى ، بينما كانت هذه المتوسطات عند الاخصاب على التوالى هي ٢٧٢ ± ٠٣ شهرا ، ٣١٤٨ ± ٠٣ كيلو جرام وكان متوسط طول الفترة من التلقيح الأول حتى التلقيح المخصب للعجلات التى لم تجمل من التلقيح الأول هي ٦٦٣ يوما ، وكان ٣٤% من المجموع الكلى للفترات المحصورة ما بين التلقيح الأول والتلقيح المخصب ترجع الى موت الاجنة المبكر بينما ٦٦% يرجع الى تكرار التلقيح الغير مخصب وخمول المبايض المؤقت •

٢ - كانت النسبة المئوية للعجلات التى حملت من التلقيح الأولى والثانية والثالثة والرابعة فأكثر هي على التوالى ٥٥٨% ، ٢٧٤% ، ١٠٠% ، ٦٣% وقد وجد ان موسم السنة تأثير ملحوظ على نسبة الاخصاب فكانت هذه النسبة هي ٧٧٣% ، ٧٠٧% ، ٦٩٢% ، ٢٢٢٢% على التوالى فى الخريف والشتاء والربيع والصيف ، بينما كان عدد التلقيحات اللازمة لكل اخصاب متساوية تقريبا فى المواسم الثلاثة الأولى على التوالى (١٥٣ ، ١٥٦ ، ١٥٠) بينما كانت عالية فى الصيف بوضوح ٢٥ تلقيحه لكل اخصاب • كذلك فان نسبة الخصب قد زادت وعدد التلقيحات اللازمة لكل اخصاب قد قلت وذلك بزيادة العمر ووزن الحيوان الحى •

٣ - كان متوسط طول الفترة من الولادة وحتى رجوع الرحم الى حالته الطبيعية قبل الولادة هي ٣٤٧ ± ١٥١ يوما ويتراوح المدى ما بين ١٩ الى ٥٧ يوما وكان متوسط طول الفترة من الولادة وحتى ظهور أول شبق هي ٤٣٩ ± ٤٠ يوما ويتراوح المدى ما بين ١٨ الى ١٦١ يوما ، بينما كان متوسط طول الفترة من الولادة حتى أول تبويض هي ٢٨٠ ± ١٨٤ يوما ويتراوح المدى ما بين ١٦ الى ٤٧ يوما •