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**OVARIAN HORMONES THROUGHOUT  
 THE OESTRUS CYCLE IN GOATS  
 UNDER UPPER EGYPT CONDITIONS\***  
 (With 8 Tables)

By

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قياس تركيز الهرمونات المبيضية خلال مراحل دورة الشبق  
 بالماعز تحت ظروف مصر العليا

فيصل الحمصي ، ابراهيم سالم ، فاروق علام ، أنس العربي

وجد من الدراسة أن هناك فرق معنوي بين الماعز البلدى والخليط في تركيز مستوى هرمونات البروجسترون كما وجد أن متوسط العام لهرمون البروجسترون كان  $22 + 24$  نانوجرام/مل سيرم الدم في الماعز البلدى مقابل  $14 + 18$  نانوجرام/مل سيرم الدم في الماعز الخليط. ووجد أيضا أن أقل تركيز لهرمون البروجسترون قد لوحظ في بداية ظهور الشبق في كل من الماعز البلدى والخليط بمتوسط  $0.7 + 0.2$ ،  $0.5 + 0.4$  نانوجرام/مل سيرم الدم على التوالي كما أن أقصى مستوى لهرمون البروجسترون قد شوهدت في اليوم 14 من ادورة الشبق للماعز البلدى بمتوسط  $4 + 8$  نانوجرام/مل سيرم وفي اليوم العاشر من الماعز الخليط بمتوسط  $3 + 5$  نانوجرام/مل سيرم الدم. وجد أيضا من الدراسة أن هناك اختلاف بين الماعز البلدى والخليط في مستوى هرمون الاستراديول 17 بيتا أثناء دورة الشبق 1. وجد أن المتوسط العام لتركيز هرمون الاستراديول 17 بيتا كان  $288 + 23$  بيكوغرام/مل سيرم الدم في الماعز البلدى مقابل  $220 + 16$  بيكوغرام/مل سيرم الدم في الماعز الخليط. ومن جهة أخرى لا يوجد تأثير للموسم على تركيز هرمون الاستراديول 17 بيتا في كل من الماعز البلدى والخليط على السواء. ووجد أن أقصى مستوى لهرمون الاستراديول 17 بيتا قد سجل في اليوم الأول من ظهور الشبق بمتوسط  $6 + 9$ ،  $47 + 4$  بيكوغرام/مل في الماعز البلدى والخليط على التوالي. بالإضافة الى ذلك فان هرمون الاستراديول زاد تركيز مع انخفاض تركيز مستوى هرمون البروجسترون خلال مراحل دورة الشبق.

**SUMMARY**

The study was carried out in the Experimental Farm, Faculty of Agriculture, Assiut University. The study started at 1st of December 1985 until 1st of December 1986 on 9 does (5 Egyptian Baladi and 4 Anglo-Nubian crossbred goats) for determination of estradiol 17B ( $E_2$  Quant) and Progesterone hormones. Goats fed the available green fodder throughout the year by

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grazing plus pelleted concentrates 1 Kg/head/day. Two hundred seventy blood samples had been taken during 7 oestrus cycles in January (winter), April : May (spring), July (summer) and October (autumn).

**The obtained results summarized as follows:**

Progesterone hormone concentration in blood serum showed significant difference between the two studied breeds and between individuals within each breed ( $P/0.05$ ). The oestrus cycle overall mean was  $2.4 \pm 0.2$  ng/ml blood serum of Egyptian Baladi v.s.  $1.4 \pm 0.2$  ng/ml blood serum of crossbred. The lowest level of the concentration occurred on the day (0) of oestrus cycle in both breeds, it was  $0.7 \pm 0.02$  and  $0.5 \pm 0.04$  ng/ml blood serum, respectively. The maximum concentration was recorded on days 14 and 10 after oestrus in Egyptian Baladi and crossbred with averages of  $5.4 \pm 0.8$  and  $3.1 \pm 1.5$  ng/ml blood serum, respectively.

There were significant differences ( $P/0.01$ ) between the two studied breeds and between individuals within each breed in the estradiol 17B level during oestrus cycles. The overall mean of the estradiol 17B was  $35.88 \pm 3.3$  pg/ml blood serum in Egyptian Baladi v.s.  $22.0 \pm 1.6$  pg/ml blood serum for crossbred. On the other hand, there was no effect of season on estradiol 17B concentration. The maximum level of hormone was recorded on the day (0) of oestrus; Being  $65.0 \pm 9.2$  and  $47.7 \pm 6.4$  pg/ml blood serum for Egyptian Baladi and crossbred, respectively.

**INTRODUCTION**

The ovary produces two main steroid hormones, estradiol 17B and progesterone, which bring about changes in the genital tract and some other systemic effect. Available information on ovarian hormones pattern in goats is scant. There is no much available references on goats indicate the effect of breed on the progesterone hormone concentration as in sheep.

Usually, the concentration of estradiol 17B hormone increases in the late luteal phase of the cycle to reach the maximum level when the progesterone concentration tends to the minimum value (MOORE *et al.*, 1969; PANT *et al.*, 1977 and CAHILL *et al.*, 1981).

The main purpose of the present work was mainly to clear the profile of progesterone and estradiol 17B hormones through the oestrus cycle and oestral period. These were given particular consideration in discussing the reproductive efficiency of the Baladi and Anglo-Nubian crossbred goats.

**MATERIAL and METHODS**

This study was carried out in the Experimental Farm, Faculty of Agriculture, Assiut University. The study started at 1st of December 1985 until 1st of December

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1986 on 9 does (5 Egyptian Baladi and 4 crossbred goats). Blood samples were obtained 10 ml daily at 8.0. a.m. during oestrus period. Samples were collected on days 1,4,10,12, 14,16 and 18 after oestrus/oestrus cycle/season. And one sample pro-oestrus and one sample obtained during the day (O) of oestrus. Blood serum was assayed by radioimmunoassay (RIA) for determination of both estradiol 17B and progesterone hormones in the Reproductive Biology Unit, Faculty of Medicine, Assiut. Both E<sub>2</sub>-Quant and progesterone 125 I kits were purchased from radio chemical centre (cis Leeco). Both concentrations were applied according to procedural instructions and calculations of results were executed exactly like that mentioned by LEECO, 1986.

Goats fed on the available green fodder throughout the year by grazing plus pelleted concentrates 1 Kg/head/day. Animals were kept in semi open pens under normal environmental conditions. The data were analysed using least squares analysis of variance (HARVEY, 1987).

### RESULTS

Results are presented in tables (1 : 8).

### DISCUSSION

The oestrus cycle overall mean of estradiol 17B concentration was  $35.88 \pm 3.3$ ,  $22.00 \pm 1.6$  pg/ml blood serum for Egyptian Baladi and crossbred does, respectively (tables 1,2). The differences between the two studied breeds were significant ( $P/0.01$ ). The high concentration found in Baladi goats may be attributed to the large number of Graafian follicles in Baladi ovaries compared with those of crossbred does. These results are in accordance with HOLST *et al.* 1972; RAWLINGS & WARD, 1978 and SCARAMUZZI & LAND, 1978.

Table (2) indicated also no significant effect of season on the estradiol 17B in both Baladi and Anglo-Nubian crosses. The maximum level of estradiol 17B recorded in the day (O) of the oestrus cycle with averages of  $65.0 \pm 9.2$  and  $47.4 \pm 6.4$  pg/ml blood serum for Baladi and Anglo-Nubian crosses, respectively (Tables 3, 4). These differences were significant ( $P/0.01$ ). On the other hand minimum level recorded on the day (14) of oestrus  $21.8 \pm 4.1$  pg/ml in Egyptian Baladi v.s.  $12.0 \pm 1.2$  and  $13.8 \pm 2.9$  pg/ml recorded on days 1, 16 in crossbred. These results are in agreement with those obtained by LUCARONI *et al.*, 1980; BHATTACHARYA *et al.*, 1981 and CHUNG *et al.*, 1985.

Tables (5, 6) showed significant differences ( $P/0.05$ ) between the Egyptian Baladi and crossbred does in the concentration of progesterone throughout the experiment. The data were  $2.4 \pm 0.2$  and  $1.4 \pm 0.2$  ng/ml blood serum for Egyptian Baladi and crossbred, respectively. These results may be attributed to the Egyptian Baladi goats had more corpora lutea in their ovaries than those of crossbred goats. THORBURN *et al.* (1969) mentioned that the variations between breeds in progesterone concentration were referring to the variation in the number of corporas.

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Table (5) indicated also significant effect ( $P/0.05$ ) of season on the progesterone in the two breeds. The maximum level of progesterone  $2.9 \pm 0.6$  ng/ml and the low level was  $1.7 \pm 0.2$  ng/ml blood serum in winter and in summer for Egyptian Baladi, and  $1.8 \pm 0.3$  ng/ml for maximum level,  $1.0 \pm 0.1$  ng/ml blood serum for crossbred. These findings agreed with LAMOND et al. (1972).

Tables (7, 8) recorded differences ( $P/0.01$ ) throughout the oestrus cycle. Minimum level in the day (0) of oestrus with averages of  $0.7 \pm 0.02$  ng/ml,  $0.5 \pm 0.04$  ng/ml blood serum of Egyptian Baladi and crossbred, respectively. On the other hand the maximum level occurred on the day (14) in Egyptian Baladi and on the day (10) in crossbred goats with averages of  $5.4 \pm 0.8$ ,  $3.1 \pm 1.5$  ng/ml blood serum respectively. LUCARONI et al. (1980) and CHEMINEAU et al. (1982) recorded similar findings to Egyptian Baladi goats. The trend in the profile level of progesterone in both breeds is similar to those obtained by OZSAR et al. (1984).

Decreased level of estradiol with increase of progesterone in the luteal phase of the oestrus cycle in the two studied breeds were noticed. From the obtained results it could be concluded that the season affects the reproductive activity in both breeds.

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**Table (1):** Means and standard errors of blood serum estradiol 17B hormone pg/ml throughout the oestrous cycle (One cycle per month for each season) in baladi and crossbred goats.

Month	Baladi goats		Crossbred goats	
	No	X $\pm$ S.E.	No	X $\pm$ S.E.
April or May (spring) *	45	33.4 $\pm$ 7.7	18	19.8 $\pm$ 3.7
July (Summer)	45	35.5 $\pm$ 8.4	36	22.2 $\pm$ 3.6
October (autumn)	45	31.0 $\pm$ 3.9	36	23.0 $\pm$ 1.2
January (winter)	45	43.4 $\pm$ 6.5	--	-----
Overall mean	180	35.8 $\pm$ 3.3	90	22.0 $\pm$ 1.6

\*: Two animals of the crossbred goats have exhibited oestrus in May, non in April.

**Table (2):** Combined least squares analysis of variance for the effect of breed, season, day of sampling and interaction between them on the concentration of estradiol 17B Hormone in Baladi and Crossbred goats.

S.D.V.	D.F.	S.S.	M.S.	F.
A	4	12110.41	3027.60	4.113 *
B	1	5665.49	5665.49	7.696 *
S	3	3606.53	1202.17	1.633 *
P	8	22953.48	2869.18	3.898 *
B x P	8	5079.05	634.88	0.862
S x P	24	15064.12	627.67	0.853
Error	221	162681.18	736.11	

Where

A is the effect of individuals.

B is the effect of breed.

S is the effect of season

P is the effect of day of sampling throughout the oestrous cycle.

B X P is the interaction between breed and day of sampling.

S X P is the interaction between season and day of sampling.

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**Table (3):** Means and standard errors of the estradiol 17B hormone ( $E_2$ ) pg/ml blood serum throughout different periods of the oestrous cycle (One cycle per month for each season) in individuals of baladi goats.

Season	No.	-1	0	+1	4	10	12	14	16	18	( $E_2$ ) $\bar{X} \pm S.E.$
Spring (April)	1	20.80	25.40	28.00	11.00	49.00	8.80	8.42	9.83	10.70	19.1 + 4.49
	2	36.00	168.00	31.50	49.00	26.50	134.00	32.50	40.00	13.50	59.0 + 12.90
	3	40.50	38.00	8.74	8.55	9.50	8.77	9.70	9.20	9.10	15.8 + 8.44
	4	51.00	32.61	28.76	81.50	23.19	25.50	9.90	9.12	45.50	36.5 + 8.43
	5	9.12	85.00	98.00	24.36	23.03	63.50	5.47	9.07	9.97	36.8 + 11.08
$\bar{X} \pm S.E.$		31.6 $\pm$ 7.8	69.8 $\pm$ 26.6	38.6 $\pm$ 15.3	35.3 $\pm$ 14.0	28.3 $\pm$ 6.44	48.3 $\pm$ 23.6	14.0 $\pm$ 4.6	15.4 $\pm$ 6.1	21.7 $\pm$ 10.9	33.4 $\pm$ 7.69
Summer (July)	1	9.00	11.95	9.62	8.10	12.60	10.50	9.00	14.10	19.00	11.5 + 1.13
	2	37.50	83.50	13.50	22.50	13.00	74.50	31.00	69.50	19.20	39.0 + 12.63
	3	9.10	32.00	8.61	11.71	8.32	40.00	8.79	20.00	45.50	22.7 + 5.99
	4	65.50	125.50	24.00	14.50	90.50	19.21	35.50	26.50	8.87	45.7 + 13.30
	5	5.65	20.00	19.00	9.02	112.00	89.00	54.50	54.50	10.78	38.6 + 12.70
$\bar{X} \pm S.E.$		26.2 $\pm$ 11.2	58.5 $\pm$ 20.0	15.34 $\pm$ 2.9	13.4 $\pm$ 2.8	47.7 $\pm$ 22.1	46.6 $\pm$ 15.3	21.50 $\pm$ 5.3	36.7 $\pm$ 10.5	53.2 $\pm$ 32.8	35.5 $\pm$ 8.36
Autumn (October)	1	9.45	62.00	8.75	8.45	8.45	9.15	25.50	15.10	134.00	31.2 + 14.09
	2	36.50	57.00	66.50	15.00	33.50	28.50	8.00	46.50	21.00	34.7 + 6.43
	3	45.50	10.50	12.91	11.00	8.58	35.50	9.30	8.54	8.54	16.7 + 4.58
	4	24.50	93.00	43.00	12.82	8.88	97.50	15.94	57.50	9.46	40.8 + 11.50
	5	16.99	55.45	24.00	15.39	9.25	77.00	26.73	37.50	19.40	31.7 + 7.52
$\bar{X} \pm S.E.$		26.6 $\pm$ 6.0	56.4 $\pm$ 13.2	31.0 $\pm$ 10.6	12.6 $\pm$ 1.2	13.7 $\pm$ 4.9	45.5 $\pm$ 16.3	17.8 $\pm$ 4.9	33.1 $\pm$ 9.1	35.5 $\pm$ 23.9	31.0 $\pm$ 3.94
Winter (January)	1	57.00	77.00	72.50	22.80	16.00	60.50	38.00	46.00	73.50	60.6 + 7.50
	2	8.50	96.00	44.50	36.90	11.50	71.50	70.50	18.50	32.00	37.5 + 9.73
	3	23.00	17.00	8.92	49.50	8.80	7.66	13.19	8.80	8.79	21.3 + 6.05
	4	29.50	96.00	48.00	49.00	20.00	9.49	87.50	60.00	43.00	49.1 + 9.99
	5	40.50	90.00	69.50	25.31	37.50	21.50	9.53	126.50	11.79	48.0 + 13.20
$\bar{X} \pm S.E.$		31.7 $\pm$ 8.1	75.2 $\pm$ 14.9	48.7 $\pm$ 11.4	36.5 $\pm$ 5.5	43.9 $\pm$ 15.0	34.1 $\pm$ 13.0	33.8 $\pm$ 14.3	51.9 $\pm$ 20.7	34.2 $\pm$ 12.0	43.4 $\pm$ 6.58
Overall mean		29.0 $\pm$ 3.9	65.0 $\pm$ 9.2	33.4 $\pm$ 5.8	24.4 $\pm$ 4.4	32.9 $\pm$ 7.1	44.6 $\pm$ 8.1	21.8 $\pm$ 4.1	34.3 $\pm$ 6.6	36.9 $\pm$ 10.3	35.8 $\pm$ 4.33

Where

No. is the number of animals.

$E_2$  is the overall mean and standard error for estradiol 17B hormone during the oestrous cycle for each doe.

Table (4): Means and standard errors of the estradiol 17 $\beta$  hormone ( $E_2$ ) pg/ml blood serum throughout different periods of the oestrous cycle (One cycle per month for each season) in individuals of crossbred goats.

Season	No.	-1	0	+1	4	10	12	14	16	18	( $E_2$ ) $\bar{x} \pm$ S.E.
Summer (July)	1	16.80	13.60	8.90	13.80	8.80	17.00	14.40	8.90	9.00	12.4 $\pm$ 1.16
	2	7.64	63.50	7.24	13.20	7.80	6.10	54.00	15.75	18.50	21.5 $\pm$ 7.21
	3	8.55	39.50	17.65	23.00	24.50	8.75	60.50	11.80	13.90	25.4 $\pm$ 6.81
	4	66.50	39.00	14.81	17.94	71.50	13.91	22.70	9.36	9.38	29.5 $\pm$ 8.05
$\bar{x} \pm$ S.E.	24.8 $\pm$ 14.0	43.9 $\pm$ 11.4	12.2 $\pm$ 2.4	16.9 $\pm$ 2.2	28.1 $\pm$ 14.0	11.4 $\pm$ 2.5	37.9 $\pm$ 11.4	11.4 $\pm$ 1.6	12.6 $\pm$ 2.2	22.2 $\pm$ 3.65	
Autumn (October)	1	27.50	9.40	17.50	15.60	69.50	9.50	8.50	39.00	12.8	23.2 $\pm$ 6.67
	2	12.26	62.50	14.50	8.60	6.53	43.50	7.82	7.10	18.80	20.2 $\pm$ 6.53
	3	9.20	58.00	11.95	18.80	8.55	94.00	10.38	13.50	8.55	26.2 $\pm$ 9.45
	4	25.72	56.50	10.88	9.51	18.80	21.85	35.50	10.90	14.24	22.7 $\pm$ 5.07
$\bar{x} \pm$ S.E.	18.7 $\pm$ 4.1	46.6 $\pm$ 11.1	13.7 $\pm$ 1.3	13.0 $\pm$ 2.5	25.9 $\pm$ 14.2	42.2 $\pm$ 18.0	15.6 $\pm$ 6.6	18.2 $\pm$ 7.2	13.6 $\pm$ 2.0	23.1 $\pm$ 1.22	
Spring (May)	1	8.60	59.90	8.50	15.50	11.10	13.00	9.00	12.10	8.00	16.2 $\pm$ 5.53
	2	---	---	---	---	---	---	---	---	---	---
	3	---	---	---	---	---	---	---	---	---	---
	4	9.62	52.00	8.90	63.50	12.95	13.50	8.48	7.45	34.77	43.5 $\pm$ 7.10
$\bar{x} \pm$ S.E.	9.1 $\pm$ 0.7	53.9 $\pm$ 3.5	8.6 $\pm$ 0.3	39.5 $\pm$ 24.2	12.0 $\pm$ 0.9	13.2 $\pm$ 0.2	8.7 $\pm$ 0.3	9.8 $\pm$ 2.3	21.0 $\pm$ 13.0	19.8 $\pm$ 3.66	
Winter (January)	1	---	---	---	---	---	---	---	---	---	---
	2	---	---	---	---	---	---	---	---	---	---
	3	---	---	---	---	---	---	---	---	---	---
	4	---	---	---	---	---	---	---	---	---	---
$\bar{x} \pm$ S.E.	---	---	---	---	---	---	---	---	---	---	
Overall mean	19.2 $\pm$ 5.7	47.4 $\pm$ 6.4	12.0 $\pm$ 1.2	19.9 $\pm$ 5.0	24.0 $\pm$ 7.9	24.1 $\pm$ 9.4	23.1 $\pm$ 6.3	13.8 $\pm$ 2.9	14.8 $\pm$ 2.5	22.1 $\pm$ 1.55	

Where

No. is the number of animals.

$E_2$  is the overall mean and standard error for estradiol 17 $\beta$  hormone during the oestrous cycle for each doe.



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**Table (5):** Means and standard errors of blood serum progesterone hormone ng/ml throughout the oestrous cycle (One cycle per month for each season) in baladi and Crossbred goats.

Month	Baladi Goats			Crossbred Goats	
	Progesterone			Progesterone	
	No	$\bar{X} \pm$ S.E.	No	$\bar{X} \pm$ S.E.	
April, May (Spring) *	45	2.4 $\pm$ 0.5	18	1.4 $\pm$ 0.3	
July (Summer)	45	1.7 $\pm$ 0.2	36	1.0 $\pm$ 0.1	
October (Autumn)	45	2.7 $\pm$ 0.4	36	1.8 $\pm$ 0.3	
January (Winter)	45	2.9 $\pm$ 0.6	--	-----	
Overall mean	180	2.4 $\pm$ 0.2	90	1.4 $\pm$ 0.2	

\*: Two animals of the crossbred goats have exhibited oestrus in May, non in April.

**Table (6):** Combined least squares analysis of variance for the effect of breed, season, day of sampling and interaction between them on the concentration of progesterone hormone in baladi and crossbred goats.

S.O.V.	D.F.	S.S.	M.S.	F.	
A	4	45.638	11.409	2.815	*
B	1	25.931	25.931	6.398	*
S	3	45.278	15.093	3.724	*
P	8	325.979	40.747	10.054	**
B x P	8	71.012	8.876	2.190	*
S x P	24	153.655	6.402	1.580	
Error	221	895.639	4.052		

Where

A is the effect of individuals.

B is the effect of breed.

S is the effect of season.

P is the effect of day of sampling throughout the oestrous cycle.

B X P is the interaction between breed and period of cycle.

\* = P/ 0.05.

S X P is the interaction between season and periods of cycle.

\*\* = P/ 0.01.

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**Table (7):** Means and standard errors for blood serum concentrations of the progesterone hormone (ng/ml) throughout the oestrous cycles (One cycle per month for each season) in baladi goats.

Month	Days of oestrous cycle								
	-1	0	+1	4	10	12	14	16	18
	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$
April (Spring)	1.1 $\pm$ 0.33	0.8 $\pm$ 0.03	0.9 $\pm$ 0.10	2.0 $\pm$ 0.44	2.6 $\pm$ 0.80	2.9 $\pm$ 1.50	7.3 $\pm$ 2.20	3.1 $\pm$ 1.10	1.4 $\pm$ 0.50
July (Summer)	0.8 $\pm$ 0.03	0.7 $\pm$ 0.06	0.8 $\pm$ 0.09	0.7 $\pm$ 0.06	1.8 $\pm$ 0.70	3.3 $\pm$ 0.50	2.7 $\pm$ 0.60	3.2 $\pm$ 1.20	1.4 $\pm$ 0.70
October (Autumn)	0.9 $\pm$ 0.05	0.7 $\pm$ 0.04	0.7 $\pm$ 0.08	1.7 $\pm$ 0.50	1.6 $\pm$ 0.60	5.8 $\pm$ 1.00	5.9 $\pm$ 1.00	4.1 $\pm$ 0.80	2.5 $\pm$ 1.40
January (Winter)	1.6 $\pm$ 0.80	0.7 $\pm$ 0.07	0.7 $\pm$ 0.07	1.9 $\pm$ 1.00	5.3 $\pm$ 1.40	6.6 $\pm$ 2.30	5.7 $\pm$ 1.50	2.4 $\pm$ 0.80	1.3 $\pm$ 0.70
Overall mean	1.1 $\pm$ 0.20	0.7 $\pm$ 0.02	0.8 $\pm$ 0.05	1.6 $\pm$ 0.40	2.8 $\pm$ 0.50	4.6 $\pm$ 0.80	5.4 $\pm$ 0.80	3.2 $\pm$ 0.50	1.6 $\pm$ 0.40

**Table (8):** Means and standard errors for blood serum concentrations of the progesterone hormone (ng/ml) throughout the oestrous cycle (One cycle per month for each season) in crossbred goats.

Month	Days of oestrous cycle								
	-1	0	+1	4	10	12	14	16	18
	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$	$\bar{X} \pm S.E.$
May (Spring)	0.8 $\pm$ 0.10	0.7 $\pm$ 0.20	0.7 $\pm$ 0.06	0.6 $\pm$ 0.10	1.2 $\pm$ 0.70	2.3 $\pm$ 1.20	5.0 $\pm$ 3.00	0.9 $\pm$ 0.05	0.7 $\pm$ 0.20
July (Summer)	0.9 $\pm$ 0.40	0.5 $\pm$ 0.03	0.7 $\pm$ 0.10	0.7 $\pm$ 0.08	0.9 $\pm$ 0.20	1.0 $\pm$ 0.20	1.0 $\pm$ 0.10	2.8 $\pm$ 1.20	0.8 $\pm$ 0.20
October (Autumn)	0.7 $\pm$ 0.07	0.5 $\pm$ 0.02	0.8 $\pm$ 0.04	1.1 $\pm$ 0.30	6.4 $\pm$ 3.20	1.9 $\pm$ 0.20	2.0 $\pm$ 0.70	1.6 $\pm$ 0.40	1.1 $\pm$ 0.40
January (Winter)	-----	-----	-----	-----	-----	-----	-----	-----	-----
Overall mean	0.8 $\pm$ 0.10	0.5 $\pm$ 0.04	0.7 $\pm$ 0.04	0.8 $\pm$ 0.10	3.1 $\pm$ 1.50	1.6 $\pm$ 0.20	2.3 $\pm$ 0.70	1.9 $\pm$ 0.50	0.9 $\pm$ 0.10