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Biochemical And Histological Changes In The Ovary Of The Doe Goats During The Breeding And Non-Breeding Seasons Under Egyptian Conditions

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ABSTRACT

A total number of 41 clinically healthy Balady doe goats during breeding (n=23) in spring and non-breeding seasons in summer (n=18), were used in the present study. After slaughtering, 82 left and right ovaries, were collected from slaughterhouse. Activities of the left and right ovaries, blood haematology and blood serum components in the breeding and non-breeding seasons, were recorded. Histological changes of the left and right ovaries, were also recorded.

The results showed that haemoglobin, haematocrit, red blood cells and white blood cell counts decreased significantly ($P<0.01$) in the non-breeding than in the breeding season. Blood serum total proteins, albumin, globulin, creatinine, total lipids, and oestradiol-17β concentrations increased significantly ($P<0.01$), while total cholesterol concentration, aspartate-aminotransferase (AST), alanine-aminotransferase (ALT) and alkaline phosphatase (ALP) enzyme activities decreased significantly ($P<0.01$) in the breeding than in the non-breeding season. The ovary showed higher activity in the breeding than in the non-breeding season. The ovary weight, number of corpora lutea, normal of follicles, total number of follicles, cumulus oocytes complexes (COC's), partially denuded cumulus oocytes (PDCO), expanded cumulus oocytes (ECO), denuded cumulus oocytes (DCO), total number of oocytes and oocytes recovery rate increased significantly ($P<0.01$), while the number of atretic follicles decreased significantly ($P<0.01$) during the breeding than in the non-breeding season. The left ovary increased significantly ($P < 0.01$) in the weight, number of corpora lutea, normal of follicles, total number of follicles, COC's, PDCO, ECO, DCO and total number of oocytes, while it decreased significantly ($P<0.01$) in the number of atretic follicles and oocytes recovery rate than in the right ovary either during the breeding or non breeding season. The goats showed also less ovarian activity, less oocytes quality and interstitial tissues in the non – breeding season. The left ovary included more growing and mature follicles and higher activity than the right ovary.

INTRODUCTION

Goats play an important role in the animal agriculture system of Egypt, since they constitute a major source among farm animals for red meat production around the year, in particular for religious occasions. Increasing kid production in the subtropics can be achieved mainly through increasing the number of kids per doe and the number of kidings per year. The latter trait relies on utilizing the animal at different times of the year *(1)*.

In desert area goats are consider as an important source of meat and to a lower extent a milk producer. Goats are consider of the second rank as a source of milk after cattle. However, animal production in the desert confronts several constraints. In this respect, goats as affected by such conditions, are not yet evaluated.

Reproduction is the first basis of livestock production. The oocyte recovered from follicles of ovary are potential for *in-vitro* maturation. These occytes could be used as a source of embryos for embryo transfer technology in livestock *(2)*. It has been shown *(3)* that there is direct relationship between morphological characteristics of follicular oocyte and their ability to mature *in-vitro*. In view of the above, this study was undertaken for investigation of the morphometric characterization of different grades of oocytes and to study the association of oocyte morphology with their respective follicular diameter.

The blood components are the mirror, which reflects the healthy conditions of animals. So, the biochemical studies under different fluctuating climate conditions is very important for clinicians in the field during interpretation of their findings. In addition, the minerals and trace elements has long been known to be important in animal nutrition as they are dietary essential and vital to enzyme processes of living cells or have some metabolic activity.

The present study was aimed to compare between the breeding and the non-breeding seasons in blood haematology and blood components. Oocyte status and histological changes of the left and right ovaries of the doe goats, were also recorded.

MATERIALS AND METHODS

A total number of 41 non-pregnant Balady doe goats (23 does during the breeding season and 18 during the non-breeding season) of 15 to 20 months age and 30 kg body weight, were chosen from the collecting yard of Balbies slaughterhouse. Belbies City, Belbies, Sharkiya Province, located in the north eastern part of the Nile Delta (30°N).

All goats were healthy and clinically free of external and internal parasities.

Two blood samples were obtained from each doe goat, at slaughtering. One using anticoagulait for blood parameter the other sample without anticoagulait and serum was obtain and stored at - 4°C till used for biochemical determination.

During summer season, the animals were fed on clover hay and concentrate feed mixture (14% crude protein) consisted of 35% undecorticated cotton seed meal, 22% corn, 33% wheat bran, 4% rice bran, 3% molasses, 2% limestone and 1% salt. During spring, all animals were fed *ad libitum* on berseem (*Trifolium alexandrium*) in addition to a 400 g/head/day of concentrate feed mixture. Animals were allowed to drink fresh water twice daily.

Ovaries collection

The total number of 82 pairs of ovaries of the non-pregnant Balady doe goats during breeding (n= 23) and non-breeding seasons (n=18), were used in the present study. After removal of the extraneous tissues each ovaries (right or left) were weighed using electric balance. Two ovaries (right and left) from each doe goat were collected immediately after slaughtering within 30 - 60 minutes and washed by sterile warm normal saline solution (0.9% NaCl) at 28-32°C containing 100 IU /ml penicillin and 100µg/ml streptomycin and then transported to the laboratory.

Follicle type

All normal visible follicles (2-6mm) or corpora lutea either left or right ovaries were counted. The follicles were differentiated as follow ***(4)***.

a-Normal follicles: were turgid, transparent, almost spherical, easily squeezable and thick walled.

b-Atretic follicles: were opaque, nearly spherical and relatively thin walled.

Oocytes collection was carried as described previously ***(4).***

Oocytes recovery rate was determined by the following formulae ***(5)***

$$\text{Recovery rate} = \frac{\text{No. of oocytes recovered}}{\text{No. of vesicular follicles}} \times 100$$

The oocytes were evaluated in respect to both investment and ooplasma granulation of cumulus cells as follows ***(5)***.

a. Cumulus oocytes complexes (COC´s)

The oocytes with complete compact dense cumulus oophorus more than 6 layers.

b. Partially denuded cumulus oocytes (PDCO)

The oocytes with compact cumulus layers not completely surrounding the oocyte or less than 3 to 5 layers.

c. Expanded culmulus oocytes (ECO)

The oocytes are surrounded by expanded 1 to 2 layers of cumulus cells appearing as scattered clamps in the matrix .

d. Denuded cumulus oocytes (DCO)

The oocytes enclosed only by the zona pellucida without cellular investment .

Blood serum components

Total proteins *(6)* and Albumin concentration *(7)* were determined colourimetrically. Globulin concentration was calculated by subtraction of albumin from the corresponding total proteins value. Total lipids and creatinine concentrations were determined colourimetrically using commercial kits (Bio Meriux, Laboratory Reagnets and Products, France). Oestradiol-17β hormone concentration was estimated by RIA using the commercial radioimmunoassay kits *(8)*. Total cholesterol concentration *(9)*, Aspartate-aminotransferase (AST), alanine-aminotransferase (ALT) *(10)*, and Alkaline phosphatase (ALP) activities were determined colourimetrically using commercial kits purchashed from Biomeriux (Marcy L'E Potile, Charbonnieres, Les Bains, France) according to *(11)*.

Histological studies :

Histopathological sections from ovaries were performed *(12)* and stained with H & E stain.

Statistical analysis :

Data were statistically analyzed using least square of analysis of variance according to *(13)*. Duncan's new multiple range test *(14)* was used for the multiple comparisons.

RESULTS AND DISCUSSION

Blood haematology

Table 1, shows that blood haemoglobin, haematocrit, red blood cells (WBC's) and white blood cells (WBC's) counts during breeding season were significantly (P<0.01) higher in goats than non-breeding one. The increase in haemoglobin, haematocrite and RBC's values might be is evidence to increase haemoconcentration. This was initially induced by an increase in erythrocyte number and later by plasma dehydration *(15)*. The increase of WBC's count during breeding season may be a response to the stress of the breeding seasons to help the body resistance against exhaustion *(16)*. Similar trends were reported in goats *(17)*.

Ovarian status

The results obtained in Table 2 showed that the ovary weight (gm) of the goats increased significantly (P<0.01), while the number of corpora lutea insignificantly increased during breeding season as compared to the non-breeding season. The increase of ovaries weight obtained in the breeding season is probably attributed to the increased follicles number or due to the increased of the follicles volume as observed in this work.

With regard to side of ovary, the left ovary weight and the number of corpora lutea of the goats were significantly (P < 0.01) higher than the right ovary (Table 2). However, the right ovary was heavier than the left ovary *(18)*. The ovary weight was insignificantly higher in the left ovary than in the right one during spring, summer and autumn seasons, while in winter season an opposite trend was observed *(19)*.

In general, the results obtained in the present study, showed that pregnancy corpus luteum does not inhibit follicular growth, whether these follicles produce oestrogen which may be required for either maintenance and persistence of the corpus luteum or for implantation *(20)*.

The number of the normal follicles of the goats was significantly (P < 0.01) higher during breeding than non-breeding season. However, the number of the atretic follicles was significantly (P < 0.01) higher during the non-breeding season than the breeding one. Similar trend was reported by *(21)* in goats.

With regard to side of ovary, number of the normal follicles in the left ovary was significantly (P < 0.01) higher than the right one, while number of the atretic follicles in the right ovary was significantly (P < 0.01) higher than the left ovary (Table 2). In goats ovary had a highly significant (P < 0.01) effect on the number of normal follicles *(21)*. Atresia of follicles could be attributed to degeneration and phagocytosis of the granulose in the follicles or to the extravasations of the blood and the formation of blood follicles *(22)*.

Table 1. Means of the blood haematology in the doe goats, during breeding and non-breeding seasons.

Items	Breeding season	Non-breeding season
Haemoglobin (g%)	12.25 ± 0.48^{a}	9.75 ± 0.64^{b}
Haematocrite (%)	35.11 ± 0.64^{a}	25.38 ± 0.81^{b}
Red blood cells ($x10^{6}/mm^{3}$)	12.41 ± 0.26^{a}	10.62 ± 0.42^{b}
White blood cells ($x10^{3}/mm^{3}$)	18.25 ± 0.81^{a}	14.36 ± 0.75^{b}

Means bearing different superscripts within the same row , differ significantly ($P<0.01$).

Table 2. Means of the right and left ovaries weight, number of corpora lutea (CL) and normal and atretic follicles of the doe goats, during the breeding and non-breeding seasons.

Items	Breeding season		Means	Non - breeding season		Means
	LO	RO		LO	RO	
Ovary weight (gm)	$1.88^{a}\pm0.04$	$1.70^{b}\pm0.06$	1.79^{A}	$1.09^{a}\pm0.08$	$0.96^{b}\pm0.08$	1.03^{B}
No. of CL/ovary	$1.28^{a}\pm0.06$	$1.06^{b}\pm0.03$	1.17^{A}	$1.06^{a}\pm0.04$	$0.84^{b}\pm0.21$	0.95^{A}
No. of normal follicles	$6.26^{a}\pm0.59$	$3.56^{b}\pm0.38$	4.91^{A}	$4.67^{a}\pm0.76$	$2.16^{b}\pm0.51$	3.42^{B}
No. of atretic follicles	$1.19^{b}\pm0.48$	$2.38^{a}\pm0.46$	1.79^{B}	$1.96^{b}\pm0.33$	$2.64^{a}\pm0.51$	2.30^{A}
Means of the total number of follicles	3.73^{a}	2.97^{b}	3.35^{A}	3.32^{a}	2.40^{b}	2.86^{B}

Means bearing different letters within the same classification, differ significantly ($P<0.01$).

LO : Left ovary

RO : Right ova

Generally, the mature follicles of goats normally became atretic in the absence of mating and follicular rupture in this species. The atresia results from the substitution of ovum and granulose cells by proliferating fibroblasts and theca cells which progressively became thecal luteinic cells *(23)*. Also, there was an atrophy and degenerative changes in the granulose cells of the cystic follicles as well as thickening in the theca externa with enlargement of the blood vessels *(24)*.

The total number of follicles of the goats per ovary collected was significantly ($P < 0.01$) higher during the breeding than the non-breeding season. Similar results were reported in the goats *(25)*.

With the regard to side of ovary, the total number of follicles of the goats was significantly ($P < 0.01$) higher in the left ovary than the right one (Table 2). Similar trend was reported by *(26)* in the goats.

Oocyte status

Data presented in Table 3 showed that the cumulus oocytes complexes (COC's), partially denuded cumulus oocytes (PDCO) and the total number of oocytes of the goats increased significantly ($P<0.01$) in the breeding as compared with the non-breeding season. However, the expanded cumulus oocytes (ECO) and denuded cumulus oocytes (DCO) of the goats were insignificantly higher during breeding than the non-breeding season Similar trends were in deer *(27)*. On the other hand, the oocytes recovery rate was significantly ($P<0.01$) increased in the breeding season as compared to the non-breeding one. Similarly, in deer *(27)* and in she-camel *(28)* it has been found that the highest numbers of COC's and PDCO were recorded during breeding season and the lowest numbers were recorded during non-breeding season.

Regarding side of ovary, the numbers of COC's, PDCO, ECO and DCO oocytes and oocytes recovery rate of the goats were significantly ($P<0.01$) higher in the left than the right ovary (Table 3). In deer *(27, 28)* the ovary had significant ($P<0.01$) effect on the oocytes recovery rate being higher in the breeding than the non-breeding season.

In general, it is interested to notice that, superiority of the oocytes recovery in both left and right ovaries of the goats was recorded in the breeding season as compared to the non-breeding season. These probably may be due to that the gonadotropic hormonal balance was in favour of the follicular growth stimulation oocyte status in the breeding season but is not in favour of ovulation process.

Blood serum components:

Total protein, albumin, globulin and cholesterol

Data presented in Table 4 shows that total protein concentration (mg/dl) of the goats during non- breeding season increased significantly ($P<0.01$) as compared to breeding one. However, albumin and globulin concentrations (mg/dl) were insignificant being higher in the non-breeding season than breeding one. The increase of total protein during non-breeding season (summer) may be attributed to exposure to heat - stress which represent the potent stimulus for growth hormone releasing *(29)* which lead to increase plasma proteins that are considered important in maintaining plasma water *(30)* or due to haemoconcentration during summer. Moreover, physiological hypothyroidism during summer was accompanied by protein deposit for retaining plasma water. Seasonal effects on serum albumin and globulin concentrations of the goats were insignificant *(17)*. These results may be attributed to the fact that goats after prolonged exposure to heat stress in their natural habitat becomes more adapted to heat stress and the changes in the above mentioned physiological parameters vary greatly, so that is values may not be reliable indicators of animal ability to adjust to short or long stressful conditions.

Total cholesterol, creatinine and total lipids concentrations (mg/dl) of the goats during breeding season were significantly ($P<0.01$) higher than the non-breeding season. In goats *(17)* and in she-camel *(28)* similar findings were recorded. Total cholesterol concentration recorded in the serum markedly depends on

Table 3. Means of the oocytes status in the right and left ovaries of the doe goats, during the breeding and non-breeding seasons.

Items	Breeding season		Means	Non - breeding season		Means
	LO	RO		LO	RO	
Cumulus oocytes complexes	6.72^{a} ±0.65	4.95^{b} ±0.20	5.84^{A}	3.91^{a} ±0.84	2.18^{b} ±0.36	3.05^{B}
Partially denuded cumulus oocytes	2.87^{a} ±0.35	2.01^{b} ±0.26	2.29^{A}	2.19^{a} ±0.44	1.60^{b} ±0.31	1.90^{B}
Expanded cumulus oocytes	1.94^{a} ±0.24	1.13^{b} ±0.16	1.64^{A}	1.76^{a} ±0.25	1.01^{b} ±0.31	1.39^{A}
Denuded cumulus oocytes	1.63^{a} ±0.16	1.02^{b} ±0.03	1.38^{A}	1.78^{a} ±0.12	0.93^{b} ±0.25	1.36^{A}
Means of the total number of oocytes	3.29^{a} ±1.17	2.28^{b} ±0.92	2.78^{A}	2.41^{a} ±0.51	1.43^{b} ±0.29	1.92^{B}
Oocytes recovery rate	88.20^{b}	76.77^{a}	82.99^{A}	72.59^{b}	59.58^{a}	67.13^{B}

Means bearing different letters within the same classification, differ significantly ($P<0.01$).

LO : Left ovary

RO : Right ovary

Table 4. Serum blood components of the doe goats, during the breeding and non-breeding seasons

Items	Breeding season	Non- breeding season
Total proteins (mg/dl)	6.46 ± 0.28^{b}	7.26 ± 0.39^{a}
Albumin (mg/dl)	3.87 ± 0.42^{a}	4.47 ± 0.24^{a}
Globulin (mg/dl)	2.59 ± 0.62^{a}	2.78 ± 0.16^{a}
Total cholesterol (mg/dl)	205.42 ± 6.13^{a}	120.35 ± 5.68^{b}
Creatinine	146.74 ± 0.68^{a}	122.95 ± 0.64^{b}
Total lipids (mg/dl)	5.28 ± 0.28^{a}	3.46 ± 0.26^{b}
AST (U/L)	52.12 ± 1.28^{b}	64.15 ± 1.25^{a}
ALT (U/L)	26.33 ± 1.16^{b}	46.28 ± 2.06^{a}
ALP (U/L)	110.25 ± 5.21^{b}	119.35 ± 4.20^{a}
Oestradiol-17β (pg/ml)	129.16 ± 3.46^{a}	82.16 ± 2.53^{b}

Means bearing different superscripts within the same row, differ significantly ($P<0.01$).

AST : Aspartate-aminotransferase

ALT : Alanine-aminotransferase

ALP : Alkaline phosphatase

the environmental and seasonal variations *(31)*. The seasonal variations in serum cholesterol concentration may be due to the type of feed offered during different seasons of the year. During breeding season, the green fodder was barseem since barseem is a rich source of steroids *(32)*. The significant decrease of cholesterol during non- breeding season (summer) may be due to lower thyroid activity during rise of environmental temperature which influence serum cholesterol level.

Hormonal profiles

Oestradiol-17 β hormone concentration (pg/ml) of the goats during breeding was significantly ($P<0.01$) higher than the non-breeding season. Similar trend was reported in camels *(33)* and in goats *(17)*. These results may be attributed to involvement of oestrogens in modulation of sexual behaviour *(34)* and testosterone secretion *(35)*. It is hypothesized that, decreasing light hours and probably low temperature might be instrumental in triggering the hypothalamic hypophysical axis as was observed in other short day breeders like sheep *(36)*. In addition, the relative activity of several enzymes associated with testosterone and its conversion to oestrogen in the blood plasma was significantly lower during the non mating season than that of the mating one *(37)*.

Enzymatic activities

Aspartate-aminotransferase (AST), alanine-aminotransferase (ALT) and alkaline phosphatase (ALP) enzymes activity (U/L) of the goats during breeding decreased significantly ($P<0.01$) as compared to non-breeding season. The effect of season of the year on AST enzyme activity of the dromedary she-camels was significantly higher during non-breeding season than breeding one *(28)*. The highest activity of AST enzyme was recorded during non-breeding season and the lowest activity was recorded during breeding season *(17)*. Mobilization of the liver functions may be partially affected by heat-stress during non- breeding season.

Generally, the blood enzymes are easily and often influenced by the external environment including feeding practices, type of shelter and many other aspects of herd management, since they are ultimately related to metabolism. Accordingly, seasonal changes of the enzymes are very important and must be considered. In addition, it is also important to control carefully all experimental conditions, especially environmental ones, when measuring the enzyme activity in any animals *(38)*.

Histological changes

Microscopic examination of the ovary revealed that ovarian stroma was composed of fibrous connective tissues rich in smooth muscles cells. It can be recognized as two zones, an outers cortical zone and inner medullary zone. Connective tissues increases in density from cortical to medullary region in breeding season in the left ovary. The ovaries were covered with the functional germinal epithelium with presence of some follicles in various stages of development and develop to tertiary follicles (Fig. 1). However, left ovary follicles activities during the non-breeding season were seen in the cortex which contains primordial, secondary and tertiary or vesicular follicles. Maturation and persistence of lutenizing cells within corpora lutea were common particularly in the ovarian cortex of the majority of examined ovaries (Fig. 2). Whereas, medulla consists of loose connective tissues containing ovarian arteries, veins and lymphatics. In the non- breeding season, the ovary in comparison with that of breeding season, showed less activity, lower follicle number and higher interstitial tissues, so the ovary (right ovary) in the summer is considered in dormant phase. The surface of the some ovaries lined by flattened epithelium with presence of some degenerated primary and secondary follicles (Fig. 4). During non-breeding season microscopic examination of the right ovary, revealed the presence of dormant follicles showing some atretic changes (Fig. 4). Similar findings were reported in camels *(39)* and in goats *(40)*.

In breeding season (right ovary), the microscopic appearance of the primary follicles which observed beneath the tunica

albugenia characterized by a circular structure that contains a large ovum that surrounded by a single layer of follicular cells. However, growing follicles in the right ovary were larger and showed a cavity surrounded by the cell wall . Appeared as a large vesicle with thin wall. The granulosa cells of large follicle were arranged in columns that radiate from the basement membrane (Fig. 3). A rich bed of capillaries was found among the epithelial cells of theca interna and spindle – shaped theca externa . A loose connective tissue layer separating theca externa from the dense ovarian stroma can be seen (Fig. 3).

In respect to ovary side, the left ovary contains growing and mature follicles more than the right one. It can be noticed that, there are no much differences between the left and right ovaries activity in the same season, while the differences became greater among different seasons. The respective activity of the left and right ovary has attracted interest from different scientists because of the fact that the majority of pregnancies are established in the left horn of the uterus. Many authors have tried to explain the predominance of left – horn pregnancies in the camelidae by a difference in follicular activity and incidence of ovulation between the left ovary and the right ovary or by an increased incidence of embryo mortality for the right horn pregnancies ***(40)***.

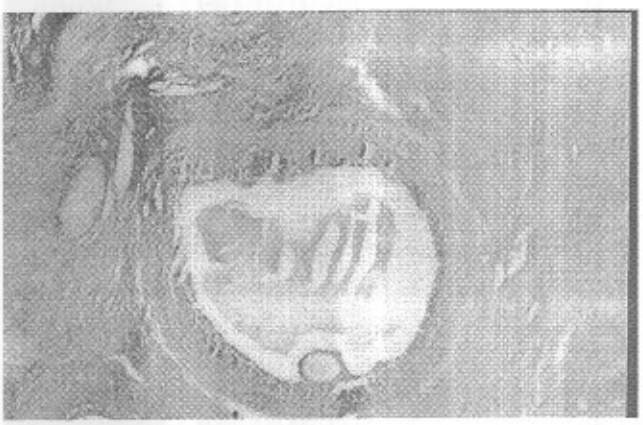

Fig. 1. Cross section in the left ovary of the goat during the breeding season showing development and maturation of some graffian follicles, H & E x 300.

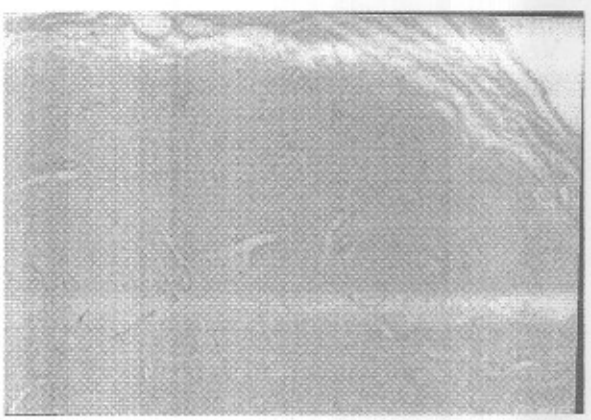

Fig. 2. Cross section in the left ovary of goat showing large corpus luteum containing luteinizing cells and surrounded by thick fibrous capsule, H & E x 300.

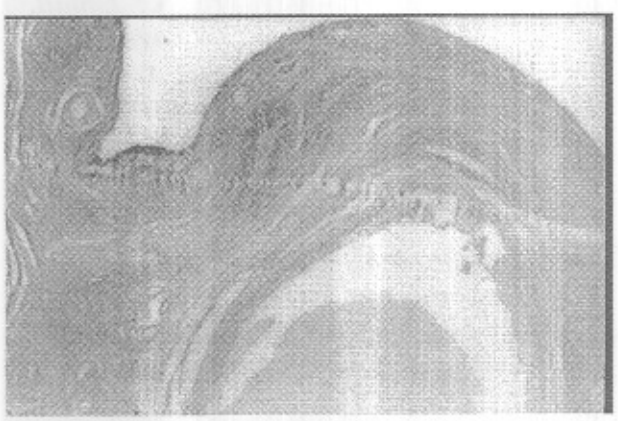

Fig. 3. Cross section in the right ovary of goat during the breeding season showing primordial, primary, secondary and tertiary follicles, H & E x 300.

Fig. 4. Cross section in the right ovary of goat showing degenerated primary and secondary follicles with flattening of the germinal epithelium, H & E x 300.

In conclusion, it can be recommended to collect and store semen of goats during spring (breeding season) for artificial insemination. Oocytes collection for in vitro fertilization (IVF) programmes can also be carried out in the same seasons to enhance fertilization of doe goats during the other periods of the year (non-breeding season) under-Egyptian environmental conditions.

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الملخص العربى

التغيرات البيوكيميائية والتشريحية فى مبيض أنثى الماعز خلال موسمى النشاط والخمول الجنسى تحت الظروف المصرية

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أجريت هذه الدراسة على عدد ٤١ أنثى ماعز زرايبى خلال موسم النشاط الجنسى (عدد = ٢٣) فى الربيع وموسم الخمول الجنسى (عدد = ١٨) فى الصيف. بعد الذبح تم جمع (٨٢) زوج من المبايض (الأيسر والأيمن) لكل أنثى من المجزر. تم دراسة النشاط المبيضى ، مكونات الدم خلال موسمى النشاط والخمول الجنسى. كذلك تم دراسة التغيرات التشريحية للمبيض الأيسر والأيمن.

أظهرت النتائج أن هناك انخفاض معنوى (على مستوى ٠,٠١) فى تركيز الهيموجلوبين ، الهيماتوكريت، عدد كرات الدم الحمراء وكرات الدم البيضاء وذلك فى موسم الخمول الجنسى عن موسم النشاط الجنسى. زيادة تركيز البروتين الكلى ، الألبيومين ، الجلوبيولين ، الكرياتينين ، الليبيدات الكلية وهرمون الاستراديول - ١٧بيتا معنوياً (على مستوى ٠,٠١) بينما انخفض تركيز الكوليسترول الكلى ونشاط إنزيمات الأمينوترانسفيريز (AST) ، الألانين أمينوترانسفيريز (ALT) والفوسفاتيز القلوى (ALP) وذلك فى موسم النشاط الجنسى عن موسم الخمول الجنسى. كان هناك زيادة معنوية (على مستوى ٠,٠١) فى وزن المبيض ، عدد الأجسام الصفراء الجريبات المبيضية الطبيعية ، العدد الكلى للجريبات على المبيض ، الخلايا المبيضية الركامية المتعددة الطبقات (COC's) ، الخلايا البيضية العارية جزئياً (PDCO) ، الخلايا البيضية المنتشرة (ECO) والخلايا البيضية العارية (DCO) ، العدد الكلى للبويضات وعدد البويضات المتحصل عليها ، بينما كان هناك انخفاض معنوى (على مستوى ٠,٠١) فى عدد الجريبات المبيضية المنتكسة وذلك خلال موسم النشاط الجنسى عن موسم الخمول الجنسى. أوضح المبيض الأيسر تزايداً معنوياً (على مستوى ٠,٠١) فى وزن المبيض ، عدد الأجسام الصفراء ، عدد الجريبات المبيضية الطبيعية ، العدد الكلى للجريبات على المبيض DCO, ECO, PDCO, COC's والعدد الكلى للبويضات بينما انخفض عدد الجريبات المبيضية المنتكسة وعدد البويضات المتحصل عليها معنوياً (على مستوى ٠,٠١) عن المبيض الأيمن سواء فى موسم النشاط أو الخمول الجنسى. أظهرت الحالة التشريحية أن هناك نشاط متزايداً للمبيض فى موسم النشاط الجنسى عن موسم الخمول الجنسى. كذلك كان هناك انخفاض واضحاً فى النشاط المبيضى وجوده البويضات والخلايا الميتة وذلك فى موسم الخمول الجنسى عن موسم النشاط الجنسى. كان هناك زيادة فى عدد الجريبات النامية والناضجة وجودة البويضات وذلك فى المبيض الأيسر عن المبيض الأيمن.