

RESPONSIVENESS OF ANGLO-NUBIAN AND DAMASCUS DOES TO CIDR-eCG PROTOCOL DURING OUT OF BREEDING SEASON

Running Title: CIDR-eCG protocol Reproductive seasonality in goats

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SUMMARY

The current study was conducted to assess the efficiency of controlled internal drug release (CIDR) device preceding equine chorionic gonadotrophin (eCG) protocol to induce synchronized fertile estrus and improve reproductive performance of Anglo-Nubian and Damascus does during out of breeding season which lasted from December to May. Forty-eight multiparous does, 24 Anglo-Nubian and 24 Damascus breeds each was further allocated into two sub-groups, 12 lactating and 12 dry does. Each doe was treated with vaginal inserted CIDR device for a period of 19 days in association with injection of 500 international units of eCG on the day of removal of CIDR. Samples of Serum were taken from each doe at day zero (CIDR insertion), day 19 (CIDR-removal), day 21 (mating), day 39 and day 56 (day 18 and day 35 after mating, respectively). Anglo-Nubian does showed higher concentration of serum progesterone and lower estradiol: progesterone (E₂:P₄) ratio compared to Damascus does. Lactating does of both breeds, produced higher estradiol and lower total antioxidant capacity (TAC) concentrations compared to dry ones. All does, achieved estrus after CIDR removal and eCG injection, but longer intervals to show estrus were recorded by lactating compared to dry goats. Anglo-Nubian does recorded higher prolificacy and fecundity compared to Damascus. In addition, the fecundity of lactating does was lower than that of dry goats. In conclusion, CIDR-eCG protocol induced successfully fertile estrus in both breeds. However, response of Anglo-Nubian does to CIDR-eCG protocol was superior to that of Damascus as evidenced by higher prolificacy and fecundity during non-breeding season.

Keywords: Goats, reproductive seasonality, CIDR-eCG protocol, prolificacy, fecundity, Total antioxidant capacity

INTRODUCTION

Anglo-Nubian goat is one of the most important dual-purpose goat breeds which has proved to be most appropriate for tropical climates and has been used widely for upgrading indigenous stock in Egypt. Damascus goat breed is distinct for its high milk yield and prolificacy in Middle Eastern countries (Mavrogenis *et al.*, 2006). In Egypt (31° N), the reproductive activity of Damascus (Taha and El-Agamey 2003) and Anglo-Nubian does (El-Mokadem *et al.*, 2017a) is completely abolished during winter and spring months from December to May. Estrus synchronization is a worthy management practice that has been employed successfully to alleviate reproductive seasonality in does (Kusina *et al.*, 2000). Using intravaginal controlled internal drug release (CIDR) device associated with equine chorionic gonadotrophin (eCG) induced synchronized estrus and ovulation efficiently during the non-breeding seasons in goat (El-Mokadem *et al.*, 2017b) in which the breeds showed poor reproductive behavior and physiological status affected ovarian activity and total antioxidant capacity (TAC) adversely.

Progesterone administered to the animal by CIDR-eCG treatment regimen being imposed prior to ovulation suppressed the count of oxytocin receptors

in the endometrium and thus reduced the uterine response to the stimulation effects of oxytocin on secretion of PGF_{2α} (Leyva *et al.*, 1998). Furthermore, the greater E₂:P₄ ratio during early gestation of ewes may contribute to an episodic release of PGF_{2α} which might result in an increased risk of maternal recognition failure of pregnancy (Abecia *et al.*, 2003). In addition, the reduction of progesterone level was due to the destruction of luteal cell steroidogenesis by the oxidative stressors (Hayashi *et al.*, 2003). Also, progesterone synthesis was inhibited by cellular reactive oxygen species (ROS) due to mitochondrial intracellular transport of cholesterol, inhibition of cytochrome P450, and degradation of LH receptors (Sugino 2006). Furthermore, the control of ROS by antioxidants is involved in promoting the physiology of the female reproductive function including embryogenesis, embryonic implantation and fetoplacental development (Agarwal *et al.*, 2008). The status of total antioxidant provides relevant biological information about the equilibrium between pro-oxidants and antioxidants in the plasma (Ghiselli *et al.*, 2000).

The goals of this study were to spotlight the effectiveness of CIDR-eCG protocol to induce synchronized fertile estrus, improve reproductive performance in general and help to explore if TAC is affected by breed or physiological status along with

determining its improvement of reproductive performance of lactating and dry Anglo-Nubian and Damascus does during out of breeding season.

MATERIALS AND METHODS

The Institutional Animal Care and Use Committee of Alexandria University approved all experiments and the study protocol (ALEXU-IACUC no. AU-08190722338). This work was conducted at the Agricultural Experimental Station (31° 20' N, 30° E) belongs to Faculty of Agriculture, Alexandria University, Alexandria, Egypt.

Animals and management:

Forty-eight multiparous does; 24 Anglo-Nubian (12 dry, weighing 31.52 ± 1.58 kg and 12 lactating, weighing 30.31 ± 1.43 kg), and 24 Damascus (12 dry, weighing 33.13 ± 3.27 kg and 12 lactating, weighing 34.17 ± 3.37 kg) at their third to fourth parities were used. During the day, does were kept outdoors with shelter and at night were housed in a semi-open barn. They were fed on Egyptian clover (*Trifolium alexandrinum*) in winter and spring and on chopped green maize in summer and autumn. In addition to green fodders, each lactating doe received 1 kg/day concentrate mixture (providing 16 % CP and 2.45 Mcal ME/kg DM) while each dry doe received only 0.5 kg/day. Water was provided throughout the day. Animals were disease free and clinically normal with healthy appearance.

Experimental design:

The present study was carried out during the anestrus season (February to May) of Damascus

(Taha and El-Agamey, 2003) and Anglo-Nubian (El-Mokadem *et al.*, 2017a) does. The experimental protocol started 40 days after parturition in December-January to make sure that uterine involution of lactating does has been completed since does can exert their first postpartum estrus after at least five weeks from parturition (Hafez and Hafez, 2000). Estrus detection was performed on all does throughout three weeks before start of the experiment. Each experimental doe (dry and lactating) was treated with intravaginal inserted Eazi-Breed CIDR device (0.3 g of progesterone; Pfizer Animal Health, West Ryde, New Zealand) which was removed after 19 days of insertion. On CIDR removal day, does were injected intramuscularly with 500 international units eCG (Syncropart; CEVA Santé Animale, Libourne, France).

Ovarian activity:

An ultrasound, real-time, B-mode scanner equipped with 7.5-MHz, linear-array and probes for rectum (Pie Medical Equipment B.V.) was used to determine the ovarian response to CIDR protocol as described by El-Mokadem *et al.* (2017b). Ovarian activities included population sizes of total follicles above 2 mm/doe; (small follicles ≥ 2 to 3 mm, medium follicles > 3 to < 5 mm and large follicles ≥ 5 mm) (El-Mokadem *et al.*, 2017b), which were recorded on day zero (CIDR insertion), day 19 (CIDR removal) and day 21 (mating). The largest follicle diameter, corpora lutea (CL) numbers and diameters were recorded. The experimental layout is displayed in Fig. 1.

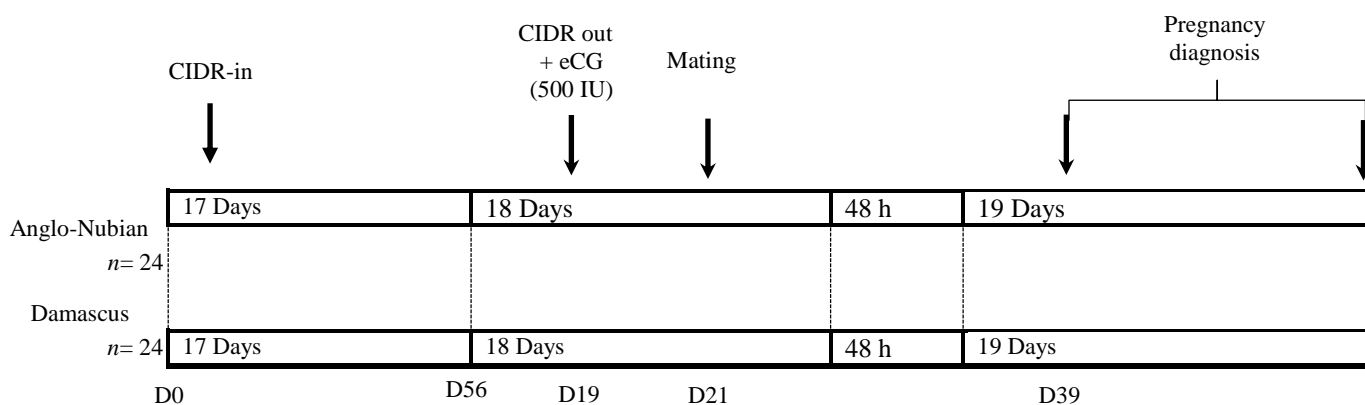


Figure 1. An experimental design to evaluate the CIDR-eCG -based estrus synchronization protocol in Anglo-Nubian and Damascus does during out-of-breeding season. CIDR: controlled internal drug release device (0.3 g progesterone); eCG, equine chorionic gonadotropin (500 IU Syncropart, intramuscular).

Concentrations of progesterone, estradiol and antioxidant capacity:

The jugular vein was used to collect blood samples from each doe before access to feed or water on day zero (CIDR insertion), day 19 (CIDR-removal), day 21 (mating), day 39 and day 56 (day

18 and day 35 after mating). Centrifugation was used to obtain serum samples at $2000 \times g$ for 20 min under 4°C and then stored at -20°C until analyses. Solid-phase enzyme immunoassay kits (Monobind Inc. Lake Forest, CA) were used to determine blood serum concentration of

progesterone and estradiol. The Lowest limit of detection for progesterone was 0.11 ng/mL serum, and the coefficients of variation of intra- and interassay were 9.3% and 9.9%, respectively. The corresponding values for estradiol were 8.2 pg/mL, 9.9% and 8.2%, respectively. E₂:P₄ ratio was calculated and serum TAC was measured as explained by Koracevic *et al.* (2001).

Measurements:

Estrus activity: does were examined twice daily for estrus signs using teaser bucks and those exhibiting estrus were mated with a fertile buck within 48 h after CIDR removal (El-Mokadem *et al.*, 2017b). Pregnancy diagnosis: blood samples were obtained on day 39 of CIDR device insertion (day 18 after mating) for determining progesterone concentrations, and concomitant with ultrasonographical examination of uterine content on day 56 (day 35 after mating).

Other reproductive performance was calculated as: 1) estrus rate: (no. of does displaying estrus / no. of synchronized does) × 100; 2) interval to estrus: the time elapsed between CIDR removal and estrus occurrence; 3) estrus duration: the time elapsed between the onset of estrus to the time when the doe did not accept the buck; 4) conception rate at day 18 after mating: [no. of conceived does at day 18 (based on P₄ concentration of 2.5 ng/ml) / no. of mated does] × 100 (Boscos *et al.*, 2003); 5) conception rate at day 35 after mating: [no. of conceived does at day 35 (based on ultrasonography) / no. of mated does] × 100; 6) prolificacy: (no. of fetuses / no. of conceived does); and 7) fecundity: (no. of fetuses / no. of mated does) × 100. (Olivera-Muzante *et al.*, 2013).

Statistical analyses:

PROC MIXED procedure of SAS 8.0 (SAS Inst., Inc.) for repeated measures was used to

analyze the reproductive performance data. The reproductive data were: ovarian activity, concentrations of P₄, E₂, E₂:P₄ ratio and TAC. The model included the fixed effects of breed (Anglo-Nubian and Damascus), lactation status of does (lactating and dry), the elapsed days of study and interactions. The effect of individual goats and residual error were random. Least significant differences (LSD_{0.05}) was used to test significant differences among means of different subclasses. The data of reproductive performance parameters were analyzed using the chi-square-test using 95% confidence interval.

RESULTS

Effect of breed and lactation status on ovarian activity and TAC:

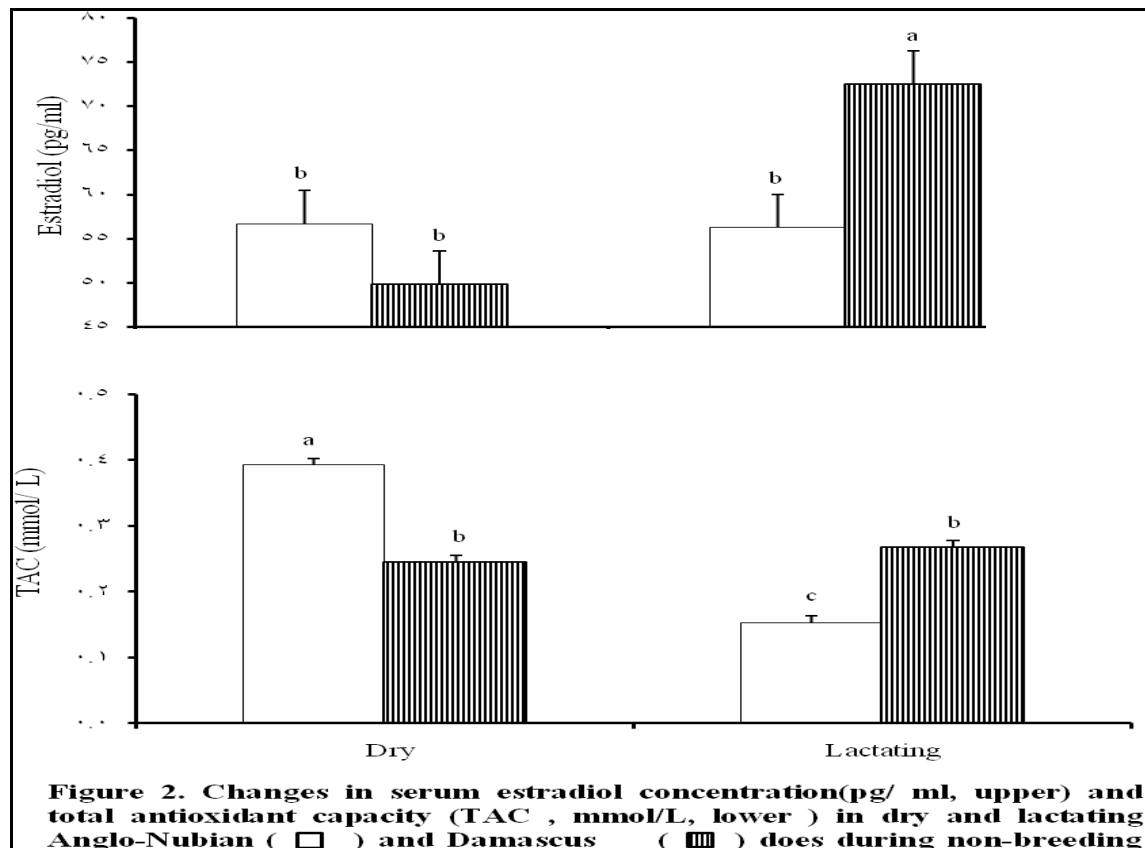
Ovarian activity, concentrations of serum estradiol and TAC were not affected by breed ($P > 0.05$). However, Anglo-Nubian does exhibited higher value of serum progesterone concentration and lower E₂:P₄ ratio ($P < 0.05$) compared to Damascus does (Table 1). The effect of lactation status and its interaction with breed did not affect progesterone concentration. Ovarian activity was not different ($P > 0.05$) between dry and lactating does, however lactating does recorded higher ($P < 0.05$) serum estradiol and lower ($P < 0.05$) TAC concentration compared to dry does. The interaction between lactation status and breed showed that lactating Damascus does recorded the highest ($P < 0.05$) concentration of serum estradiol compared to other groups (Fig. 2; upper panel). On the other hand, dry Anglo-Nubian does recorded the highest ($P < 0.05$) concentration of TAC compared to other groups, but opposite trend was observed for lactating Anglo-Nubian does (Fig. 2; lower panel).

Table 1. Effect of breed and lactation status on ovarian activity, hormonal levels and total antioxidant capacity (TAC) of Anglo-Nubian and Damascus does treated with CIDR-eCG¹ protocol during out-of-breeding season (least square means ± SEM)

Parameter	Breed		SEM	lactation status		SEM
	Anglo-Nubian	Damascus		Dry	Lactating	
Ovarian activity						
Total number of follicles per doe	3.91	3.88	0.16	4.09	3.70	0.16
Follicular population (number)						
Small follicles (≥ 2 to 3 mm)	1.60	1.47	0.15	1.77	1.30	0.16
Medium follicles (> 3 to < 5 mm)	1.33	1.36	0.13	1.28	1.41	0.13
Large follicles (≥ 5 mm)	0.98	1.04	0.09	1.03	0.99	0.09
Diameter of largest follicles (mm)	5.79	5.94	0.15	6.16	5.74	0.14
Number of corpora lutea	0.25	0.24	0.06	0.26	0.23	0.05
Diameter of corpus luteum (mm)	9.86	9.88	0.31	9.80	9.94	0.28
Hormonal level						
Progesterone (ng/mL)	2.36 ^a	0.67 ^b	0.36	1.56	1.47	0.36
Estradiol (pg/ml)	56.47	61.14	2.69	53.25 ^b	64.36 ^a	2.64
E ₂ :P ₄ ratio	0.14 ^b	0.33 ^a	0.04	0.26	0.21	0.04
TAC (mmol/L)	0.273	0.257	0.007	0.319 ^a	0.211 ^b	0.007

^{a, b} Means with different superscripts between breeds and lactation status, are significant different ($P < 0.05$).

¹ CIDR: controlled internal drug release device (contained 0.3 g of progesterone) vaginally inserted then removed after 19 days and eCG (equine chorionic gonadotropin, 500 IU) was injected to each doe at CIDR removal using 24 does/breed (12 dry and 12 lactating/breed).



With advancement of day of experimental period all ovarian activities were significantly affected, except diameter of CL (Table 2). Total number of follicles, large follicles and diameter of largest follicle tended to increase and recorded the highest ($P < 0.05$) values at day 21. On the contrary, number of small and medium follicles decreased ($P < 0.05$) at day 21 (mating). On that day, the highest ($P < 0.05$) number of large follicles was accompanied

with disappearance of CL ($P < 0.05$). Throughout the course of experiment, progesterone concentration recorded low level ($P < 0.05$) value at mating, but the highest level ($P < 0.05$) was at day 39 of the experiment (day 18 after mating), then decreased ($P < 0.05$) at day 56 (day 35 after mating). On the other hand, $E_2:P_4$ ratio showed opposite trend but serum estradiol concentration and TAC were not affected.

Table 2. Effect of elapsed day after CIDR-eCG¹ protocol on ovarian activity, hormonal level and total antioxidant capacity (TAC) of Anglo-Nubian and Damascus does during out-of-breeding season (least square means \pm SEM)

Parameter	Days ²					SEM
	0	19	21	39	56	
Ovarian activity						
Total number of follicles per doe	3.79 ^b	3.56 ^b	4.32 ^a	-	-	0.21
Follicular population (number)						
Small follicles (≥ 2 to 3 mm)	1.82 ^a	1.74 ^a	1.04 ^b	-	-	0.21
Medium follicles (> 3 to < 5 mm)	1.50 ^a	1.59 ^a	0.95 ^b	-	-	0.18
Large follicles (≥ 5 mm)	0.48 ^b	0.23 ^b	2.33 ^a	-	-	0.13
Diameter of largest follicles (mm)	5.40 ^b	5.27 ^b	6.51 ^a	-	-	0.11
Number of corpora lutea	0.30 ^a	0.44 ^a	0.00 ^b	-	-	0.06
Diameter of corpus luteum (mm)	9.80	9.93	-	-	-	0.29
Hormonal level						
Progesterone (ng/ml)	0.46 ^b	1.82 ^b	0.48 ^b	3.64 ^a	1.17 ^b	0.61
Estradiol (pg/ml)	62.27	49.97	60.35	64.17	57.27	4.45
$E_2:P_4$ ratio	0.26 ^a	0.06 ^b	0.42 ^a	0.07 ^b	0.36 ^a	0.06
TAC (mmol/L)	0.288	0.304	0.279	0.269	0.285	0.012

^{a,b} Means with different superscript within a row are significant different ($P < 0.05$).

¹ CIDR: controlled internal drug release device (contained 0.3 g of progesterone) vaginally inserted then removed after 19 days and eCG (equine chorionic gonadotropin, 500 IU) was injected to each doe at CIDR removal using 24 does/breed (12 dry and 12 lactating/breed).

² Day 0: CIDR-insertion, day 19: CIDR-removal and eCG injection, day 21: mating, day 39: hormonal diagnosis of pregnancy (day 18 after mating), and day 56: pregnancy diagnosis using ultrasonography representing day 35 after mating.

Effect of breed and lactation status on reproductive performance:

All does failed to exhibit estrus activity before CIDR insertion, but they recorded 100% estrus rate after CIDR removal and eCG injection (Table 3). Interval to estrus was not affected by breed but dry does recorded lower ($P<0.05$) interval to estrus

compared to lactating does. However, conception rate was not affected by breed or lactation status, Anglo-Nubian does recorded higher ($P<0.05$) prolificacy and fecundity at day 35 of pregnancy compared to Damascus does. Furthermore, the fecundity of dry does at day 35 after mating was higher ($P<0.05$) than that of lactating does.

Table 3. Effect of breed and lactation status on reproductive performance of Anglo-Nubian and Damascus does treated with CIDR-eCG¹ protocol during out-of-breeding season

Parameter	Breed		SEM	Physiological status		SEM
	Anglo-Nubian	Damascus		Dry	Lactating	
Estrus Activity						
Estrus rate ²	100(24/24)	100(24/24)	-	100(24/24)	100(24/24)	-
Interval to estrus(h) ³	36.0	43.2	2.76	30.00 ^b	44.88 ^a	2.76
Estrus duration (h) ⁴	55.9	67.2	8.22	66.00	55.44	8.28
Conception rate ⁵						
Day 18	58.33(14/24)	25.00(6/24)	-	33.33(8/24)	50.00(12/24)	-
Day 35	16.67(4/24)	20.83(5/24)	-	25.00(6/24)	12.50(3/24)	-
Prolificacy ⁶						
Day 35	2.00 ^a (8/4)	1.00 ^b (5/5)	-	1.33(8/6)	1.67(5/3)	-
Fecundity ⁷						
Day 35	33.33 ^a (8/24)	20.83 ^b (5/24)	-	33.33 ^a (8/24)	20.83 ^b (5/24)	-

^{a, b} Means with different superscripts between breeds and lactation status, are significant different ($P<0.05$).

¹ CIDR: controlled internal drug release device (contained 0.3 g of progesterone) vaginally inserted then removed after 19 days and eCG (equine chorionic gonadotropin, 500 IU) was injected to each doe at CIDR removal using 24 does/breed (12 dry and 12 lactating/ breed). ² Estrus rate: (no. of does exhibiting estrus/no. of synchronized does) × 100.

³ Interval to estrus: the time elapsed after CIDR removal to estrus occurrence. ⁴ Estrus duration: the interval between the estrus onset and the time when the doe did not accept the buck. ⁵ Conception rate (day 18 after mating): [no. of does conceiving on day 18 (based on P₄ concentration of 2.5 ng/ml) / no. of exposed does] × 100,

⁵ conception rate (day 35 after mating): [no. of does conceiving on day 35 (based on ultrasonography) / no. of exposed does] × 100. ⁶ Prolificacy (day 35 after mating): (no. of fetuses / conceived does). ⁷ Fecundity (day 35 after mating): (no. of fetuses / no. of exposed does) × 100.

DISCUSSION

Effect of breed and lactation status on ovarian activity and TAC:

Using CIDR-eCG protocol during non-breeding season enhanced the luteal function in Anglo-Nubian, as higher serum progesterone concentration and lower E₂:P₄ ratio compared to Damascus does were noticed. However, numbers and diameters of corpora lutea were not affected implying greater functionality of CL's in Anglo-Nubian does. The higher value of serum estradiol concentration in lactating compared to dry does could be due to its positive correlation with serum prolactin during lactation in goats (Błaszczuk *et al.*, 2004). Increasing value of serum estradiol concentration in lactating compared to dry does (Table 1) was due to lactating Damascus but not Anglo-Nubian does (Fig. 2, upper panel)

Epithelial cells of the mammary gland perform a high metabolic rate during lactation and therefore produce large amounts of ROS (Sordillo 2005). This could explain the observed reduction of TAC in lactating does compared to dry. Consequently, the absence of lactational oxidative stress increased TAC value in dry Anglo-Nubian does compared to dry Damascus does which suggested an inherent breed

differences. However, during lactation, Damascus does produced higher TAC than Anglo-Nubian concurrent with high estradiol concentration (Fig. 2, upper panel) which induced antioxidant effect (Kumar *et al.*, 2010). Furthermore, the lowest TAC value observed on lactating Anglo-Nubian does seems to be due to the interacting association between stressful effects of lactation and multiple pregnancy as does of this breed recorded greater prolificacy than Damascus does (Table 3). This is consistent with previous studies showing that carrying multiple fetuses is associated with reduction in the value of TAC (Abdel-Ghani *et al.* 2016).

The reduction in number of large follicles and diameter of largest follicle at day of CIDR-removal (day 19) were reported previously (Honparkhe *et al.*, 2011). Administration of eCG on day of CIDR removal augmented high growth rate of follicles leading to an increase in largest follicle diameter at estrus (Sá Filho *et al.*, 2010). Consequently, the increased number of total follicles at day 21 (day of mating) was due to increasing number of large follicles, whereas number of small and medium follicles diminished due to eCG administration (at day 19). This enhanced the entry of small and medium follicles into large follicles phase (Bister *et*

al., 1999). The preceding events were associated with disappearance of corpora lutea, which resulted in lowering serum progesterone concentration at day of estrus (day 21) as was reported previously by El-Mokadem *et al.* (2017b). Furthermore, progesterone administered prior to ovulation inhibited endometrial oxytocin receptors, thus reduced the response of the uterus to oxytocin for the PGF_{2α} secretion (Leyva *et al.*, 1998). In addition, administration of eCG during the anestrus period was reported to aid CL development and help increase the progesterone secretion (Fukui *et al.*, 2001). This explains the increased concentration of P₄ at day 39 (day 18 after mating). The lowest E₂:P₄ ratio recorded on day 39 (day 18 after mating) was accompanied with the highest serum progesterone concentrations similar to that reported previously in goat (El-Mokadem *et al.*, 2017b). Such low ratio declared the success of pregnancy recognition as high E₂:P₄ ratio may generate larger PGF_{2α} episodes in early pregnancy which increase the risk of pregnancy failure (Abecia *et al.*, 2003). Interestingly, increasing E₂:P₄ ratio at day 56 (day 35 of pregnancy) was associated with lower value of serum progesterone concentration and seemed to be responsible for the embryonic loss observed at this stage of pregnancy as will be discussed below.

Effect of breed and lactation status on reproductive performance:

Using CIDR-eCG protocol induced 100% estrus activity during non-breeding season in does of both breeds whether dry or lactating. These results are agreed with those reported by El-Mokadem *et al.* (2017b) on Anglo-Nubian goats. Increasing the interval to estrus in lactating does seems to be resulted from the effect of prolactin which is inversely relevant to the features of reproductive activity in goats (Mori *et al.* 1985). Interestingly, does which exhibited estrus by progesterone-eCG protocol failed to return to estrus if not conceived as was similarly reported in goat by El-Mokadem *et al.* (2017b). The present results indicated that P₄-eCG protocol succeeded to achieve fertile mating in both Anglo-Nubian and Damascus does as reported previously (El-Mokadem *et al.*, 2017b). Furthermore, the highest concentration of goat serum progesterone at day 39 (day 18 after mating) indicated a favorable effect of progesterone-eCG protocol on pregnancy rate similar to that reported on sheep (Kaya *et al.* 2013).

The reduction in conception rate observed between days 39 and 56 of the experiment (days 18 and 35 after mating) could be attributed to the greater E₂:P₄ ratio observed on day 56 (day 35 after mating) compared to the lower ratio observed on day 39 (day 18 after mating) as was illustrated by Abecia *et al.* (2003) and could be the reason behind the embryonic loss. The superior prolificacy and fecundity of

Anglo-Nubian does compared to Damascus may be due to having higher serum progesterone concentration and lower E₂:P₄ ratio. Furthermore, the lower fecundity of lactating does, especially Damascus, compared to dry could be due to higher serum estradiol concentration. High serum estradiol concentration tended to induce a premature release of uterus PGF_{2α} leading to subnormal luteal function (Ishwar and Memon 1996). On the other hand, increasing TAC in dry compared to lactating does contributed to improving reproductive performance expressed as increasing fecundity in dry compared to lactating does as illustrated by Agarwal *et al.* (2008).

CONCLUSIONS

CIDR-eCG protocol induced estrus behavior successfully and improved reproductive performance of Anglo-Nubian and Damascus does during non-breeding season. This improvement was affected by breed kind where Anglo-Nubian showed higher prolificacy and fecundity compared to Damascus does during non-breeding season. Also, fecundity was higher in dry does compared to lactating due to increasing TAC.

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Figure captions

Fig. 1. An experimental design to evaluate the CIDR-eCG -based estrus synchronization protocol in Anglo-Nubian and Damascus does during out-of-breeding season. CIDR: controlled internal drug release device (0.3 g progesterone); eCG, equine chorionic gonadotropin (500 IU Syncropart, intramuscular).

Fig. 2. Changes in serum estradiol concentration (pg/ml, upper panel) and total antioxidant capacity (TAC, mmol/L, lower panel) in dry and lactating Anglo-Nubian (□) and Damascus (■) does during non-breeding season. ^{a-c} Differ within each variable (P < 0.05) and error bars indicated a single SE of the estimates.

إستجابة عنزات الأنجلونوبيان والدمشقي لبروتوكول التحاميل المهبليّة المصحوب بالهرمون الكريوني الخيلي المنبه للغدد الجنسية خارج موسم التزاوج

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أجريت الدراسة الحالية لتحديد كفاءة التحاميل المهبليّة المصحوبة بحقن الهرمون الكريوني الخيلي المنبه للغدد الجنسية لإحداث شياخ المخصب وتحسين الكفاءة التناسلية لعنزات الأنجلونوبيان والدمشقي خارج موسم التزاوج والتي استمرت من شهر ديسمبر حتى مايو. تم استخدام عدد (٤٨) عنزة متعددة الولادة، (٢٤) أنجلونوبيان و(٢٤) دمشقي قسمت كل منها إلى تحت مجموعتين: (١٢) عنزة حلابة و(١٢) عنزة جافة. وتم معاملة كل عنزة بتحاميل مهبليّة لمدة ١٩ يوم وتلاها حقن (١٥) وحدة دولية من الهرمون الكريوني الخيلي المنبه للغدد الجنسية في يوم نزع التحاميل المهبليّة. تم اخذ عينات مصل الدم من كل عنزة في يوم بداية التجربة (يوم وضع التحاميل المهبليّة) واليوم ١٩ (يوم إزالة التحاميل المهبليّة) واليوم ٢١ (يوم التزاوج) واليوم ٣٩، ٥٦ (تمثل اليوم ١٨، ٣٥ بعد التزاوج على التوالي). وقد أظهرت عنزات الأنجلونوبيان تركيز عالي من بروجسترون مصل الدم وانخفاض نسبة هرمون الاستراديول إلى البروجسترون مقارنة بعنزات الدمشقي. أنتجت العنزات الحلابة في كلتا السلالتين تركيز عالي من هرمون الاستراديول وتركيز منخفض من المقدرّة الكلية لمضادات الأكسدة بالنسبة إلى العنزات الجافة. كل العنزات أظهرت شياخ بعد إزالة التحاميل المهبليّة وحقن الهرمون الكريوني الخيلي المنبه للغدد الجنسية ولكن أطول فترة شياخ تم تسجيلها للعنزات الحلابة مقارنة بالعنزات الجافة. حققت عنزات الأنجلونوبيان أعلى نسبة خصوبة ونسبة توأمية مقارنة بالعنزات الدمشقي. بالإضافة إلى ذلك فإن نسبة التوأمية في العنزات الحلابة كانت أقل مما هو في العنزات الجافة. الخلاصة أن بروتوكول التحاميل المهبليّة المصحوبة بالهرمون الكريوني الخيلي المنبه للغدد الجنسية نجح في أحداث شياخ مخصب في كل من السلالتين. ومع ذلك فإن استجابة عنزات الأنجلونوبيان لبروتوكول التحاميل المهبليّة المصحوبة بالهرمون الكريوني الخيلي المنبه للغدد الجنسية كانت متفوقة عما هو في عنزات الدمشقي حيث استدل على ذلك بارتفاع نسبة كلا من الخصوبة والتوأمية خلال موسم عدم التزاوج.