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OESTROUS SYNCHRONIZATION AND OVARIAN ACTIVITY OF BALADI GOATS TREATED WITH TWO HORMONAL TREATMENTS

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ABSTRACT

This study aimed to evaluate two regimens for oestrus synchronization in Baladi goats during the breeding season in Egypt. Total of 41 Baladi does were divided into three groups: group 1 (control) does were considered as control, group 2 (G2) does were treated with 2 injection of $PGF_{2\alpha}$ 11 days apart, and group 3 (G3) does were treated with daily injection with 25 ml progesterone/doe/day for successive 11 days, and one day before the end of progesterone, with a single dose of 500 I.U. PMSG. Results show that percentage of does exhibited oestrus was 78.57% and 92.85% in G2 and G3, respectively. Onset of oestrus was longer in G3 than in G2 (46.7 vs. 52.2 hr, respectively) Estrus duration was longer ($P<0.05$) in G3 than in G2 (31.9 vs. 23.5 hr, respectively). Kidding rate was higher ($P<0.05$) in G3 (85.71%) than in G2 (57.14%) and moderate in the control group (76.92%). Gestation period length was shorter in G3 than G2 and control group (144.6, 147.3 and 147.3 day, respectively). Number of kids born per doe was higher ($P<0.05$) in G3 than in G2 or control one (2.58, 2.00 and 2.20, respectively).

In conclusion, injection of PGF2α at 11 days interval during diestrus in does resulted in lower response to oestrus and fertility rate compared with those injected with progesterone + PMSG which give higher response to oestrus kidding rate and litter size.

Keywords *:* Goat, $PGF_{2}\alpha$, progesterone , PMSG, oestrus, kidding.

INTRODUCTION

Controlled breeding is an important part of any breeding program to: a) improve lambing percentage; b) to have an even lamb crop around the year and c) greater return on ewe investment. Synchronization of oestrus and timing ovulation in sheep and goats are considered to be a corner stone in formulating strategies for improving reproductive performance, planning of mating season and at some occasions to fit with the availability of feed resources (Chemineau and Cognie, 1991).

Oestrous synchronization in goats is important in the improvement of reproductive efficiencies and management processes (Freitas, *et al*., 1997 and Dogan, *et al*., 2004). Progesterone and prostaglandin analogues are widely used in goats for estrus synchronization of goats (Baril *et al*., 1993; Bretzlaff *et al*., 1991; Leboeuf *et al*., 1998 and Motolomelo *et al*., 2002). Prostaglandin protocols can be only used during the breading season terminating the luteal phase through regression of the corpus luteum (Akusu and Egbunike, 1984; Fitzgerald *et al*., 1985 and Atman et al., 2006).

Progesterone and its analogues is usually used to synchronize oestrus in goats during the breading and out of the breading season (Ak et al., 1998). Hence, following withdrawal of progesterone, oestrus and ovulation predictable period time (Bretzlaff, 1997; Leboeuf *et al*., 1998 and Dogan *et al*., 2004) gonadotrophin such as pregnant mare serum gonadtrophin (PMSG) administration have been show to stimulate oestrus in cyclic goats and affect the time of ovulation (Gordon, 1999).

Therefore, the objective of this study was to evaluate the effect of using two hormonal treatments including progesterone + PMSG protocol and $PGF_2\alpha$ at 11-day interval protocol on synchronization of oestrous and ovulation in Baladi goats during the breeding season and to detecte the most effective method of hormone treatment.

MATERIAL AND METHODS

The experimental work of this study was conducted on Baladi goats during September breeding season (2007) at the Sheep and Goats Research Station, belonging to Faculty of Agriculture, Al-Azhar University, Nassr City, Cairo, Egypt Forty one cyclic healthy clinical Baladi does weighting 24-28 kg and aging 3-4 years were used in this study. Does were divided into similar three groups according to their body weight and age. Animals were fed concentrate feed mixture (14% CP) and berseem (*Trifolium alexandrium*) during winter and berseem hay during summer according to NRC (1984). Animals were allowed free access to water, salt and mineral blocks.

Experimental groups:

Does in the 1st group (G1, n=13) were served as a control group, while those in the 2nd group (G2, n=14) were intramuscularly injected for 11 days a part with one ml Estrumate (Coopers Animal Health LTD, Berkhansted, England). Each one ml of Estrumate contained 263 μg cloprostenol sodium equivalent to 250 μg cloprostenol ($PGF_2\alpha$ analogue). However, does in the 3rd group (G3, n=14) were intramuscularly injected daily with 1 ml lutone for 11. Each one ml contained 25 mg progesterone in oily solution (Lutone, Pharm. Company Ind., Mataria, Cairo, Egypt), and one day before the end of progesterone injection does were injected intramuscularly with a single does of 500 IU PMSG (Folligon, Intervet International B.V. Boxmeer-Holland).

Oestrus detection and mating:

Starting from the 2nd Estrumate injection in G2, and last injection of progesterone in G3, oestrus was daily detected four times (30 min each) by using an intact fertile buck. Data of the onset and duration of oestrus were recorded. Does in both hormonal treatment groups were allowed for natural mating after exhibiting the first oestrus, while those in the control group were allowed for natural mating throughout 45 days within September breeding season and date of mating were recorded.

Statistical analysis:

Data were analyzed using SAS (1999), one way analysis of variance was used for onset and duration of estrous, and litter size. While, Chi-squares was used for the occurrence of oestrus and kidding rates. Duncan Multiple Range test (Duncan, 1955) was used to detect the significance between means at significant level of P<0.05.

RESULTS AND DISCUSSION

Oestrous activity:

Occurrence of oestrus:

Data in Table (1) show that oestrous rate was significantly (P<0.05) higher (92.85 vs. 78.50%) and time of oestrus occurrence was significantly (P<0.05) longer (52.20 vs. 46.71 hr) in G3 than in G2.

The observed lower response to oestrus in G2 than in G3 may be attributed to differences in ovarian status of does in G2 after than 1st $PGF_2\alpha$ injection.

Table (1): Oestrus occurrence and its frequency distribution in responding does in both treatment groups.

Group	N	Does came in oestrus		Onset of oestrus (hour)						
				Average ±SE	<36-42		>42-48		>48- >52	
		N	%		n	%	n	%	n	%
G2	14	11	78.50^{b}	46.71±4.58^{b}	6	54.5^{a}	3	27.3^{b}	2	18.2
G3	14	13	92.85^{a}	52.20±5.42^{a}	2	15.4^{b}	8	61.5^{a}	3	23.1

a and b : Means denoted within the same column with different superscripts are significantly different at (P<0.05). N = Total number of treated does.

Onset of oestrus:

It is of interest to note that the longer incidence of oestrus after the end of treatment in G3 than G2 was associated with the highest (P<0.05) frequency distribution of does came in oestrus between >42-48 hr in G3 (61.5%) and between <36-42 hr in G2 (54.5%) as show in Table (1).

Robinson, (1988) reported that the period of estrus was dependent on LH peak which occurred at 4.5 to 0.7 hr after PMSG injection. Time of onset of estrus and LH release were significantly correlated (r=0.93) with ovulation. Administration of PMSG two days before removing the progestagen impregnated vaginal sponge results in better activity (Dogan et al., 2005). The group differences in onset of oestrus may be related to that PMSG stimulate estrogen synthesis in the developing follicles and increasing the levels of circulating estrogen which stimulate endogenous FSH and LH release that affect follicle growth and induce oestrus and ovulation (Johnson *et al.,* 1996). In addition, Cline *et al.* (2001) indicated that PMSG administration had important effect on the formation of compact esters and ovulation.

The obtained results agreed with those reported by Greyling and Van Der Nest (2000), who reported that the onset of the first induced estrus occurred between 6- 120 hr after PMSG injection.

Duration of oestrus (h):

Data in Table (2) show significantly (P<0.05) longer duration of oestrus for does in G3 (31.90 hr) than in G2 (23.55 hr). This differences was attributed to the highest (P<0.05) frequency distribution of does exhibiting oestrus between >28->32 hr in G3 (61.5%) and between <20-24 hr in G2 (63.6%).

Table (2): Duration of oestrus and its frequency distribution in responding does in both treatment groups.

Group	Does came in oestrus	Duration of oestrus (hour)							
		Average±SE	<20-24		>24-28		>28->32	
			n	%	n	%	n	%
G2	11	23.55±1.76[b]	7	63.6[a]	2	18.2	2	18.2[b]
G3	13	31.90±1.85[a]	2	15.4[b]	3	23.1	8	61.5[a]

a and b: Means denoted within the same column with different superscripts are significantly different at P<0.05.

The noticed longer oestrus duration in G3 than in G2 might be due to development of more ova following P_4 + PMSG protocol than in those treated with $PGF_2\alpha$. The increased number of developed follicles leading to a higher level of plasma oestrogen, which may caused the long duration of heat. Similar finding was reported by Ashour (1993); Ahmed *et al*. (1998) and Dogan and Nur (2006). Recently, Ustruner, et al. (2007) reported that the variation between treatments in duration of oestrus might be due to the amount of oestrogen in the blood produced by induced luteolysis. The rise estrogen level in blood of brings animal into oestrus has a depressing effect on progesterone.

Kidding rate and litter size:

Resulting in Table (3) show that kidding rate was higher (P<0.05) in G3 than in G2 (85.71 vs. 57.14%). However, kidding rate of the control group did not differ significantly than those in G2 and G3, being 76.92%.

These results may be due to that PMSG induce growth of follicles and increased the ovulation and in turn kidding rate. Also, the variation of kidding rate may be due to the determined effects of synchronization on sperm transport and survival in the female reproductive tract (Pearce and Robinson, 1985), differences in the time of occurrence of oestrus (Baril et al., 1993) and extension of the lifespan of the ovulatory follicle (Vinoles et al., 1999 and Dogan and Nur 2006).

Several hypotheses have been proposed to account for the phenomenon of suboestrus following parturition in sheep and goats, although the role of luteolysis during oestrous cycle in animals is well known.

Data in Table (3) cleared that the gestation period length was shorter (144.6 days) in G3 than in both G2 and control group (147.3 days). However, the group differences were not significant.

It is worthy noting that shortening gestation period in G3 was mainly attributed to higher litter size with heavier birth weight (Eissa et al. 2003). This result is in agreement with Hanafy (2001), who reported that the length of gestation period was shorter in does treated with PMSG than in control. In this respect, Arbiza (1986) mentioned a range between 144 and 151 days for

gestation duration in goats, depending on several genetic and environmental factors.

Number of kids born was greater in does in G3 (31 kids) than in the control group (22 kids) and in G2 (16 kids). This was reflected in significantly ($P<0.05$) higher litter size in G3 (2.58) than in G2 (2.0) and control groups (2.2, Table 3). The superiority of does in G3 for litter size may be due to that PMSG may induce superovulation than in the other two groups.

These results agreed with those reported by Hanafy (2001), who found that the number of kids born per doe was greater in doe which received PMSG to induce superovulation than in non treated does. Moreover, Ashour (1993) reported that the effect of PMSG in enhancing fertility is probably a direct consequence of its action in increasing ovulation rate.

Table (3): Kidding rate and litter size of does in the experimental groups.

Group	Total No.	Kidded does			Gestation period (d)	No. of lambs born	Litter size
		Does came in oestrus	N	%			
Control	13	-	10	76.92^{ab}	147.3±2.5	22	2.20^{b}
G2	14	11	8	57.14^{b}	147.3±2.8	16	2.00^{b}
G3	14	13	12	85.71^{a}	144.6±2.5	31	2.58^{a}

a and b: Means denoted within the same column with different superscripts are significantly different at P<0.05.

Kidding synchrony and subsequent fertility:

Results indicated that average duration of the kidding season represented in treatment groups was less than 20% of that in the control group (7 days in each of treatment groups compared with 37 days in controls). On the other hand, hormonal treatment resulted in synchronized and early kidding which allowed enough time for preperation to next mating season and consequential relatively high fertility rates. These results could justify the kid production extracosts paid for hormonal treatment. Exceptionally, within hormonal treatment groups, PGF2α compared with progesterone + PMSG protocols, albeit much less costing, resulted in marked low kids production (16 vs. 31 kids) and it is unreasonable to be recommended.

In conclusion, injection of PGF2α at 11 days interval during diestrus in does resulted lower response to oestrus and fertility rate compared with those injected with progesterone + PMSG which give higher response to oestrus, kidding rate and litter size.

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يهدف هذا البحث إلى تقييم طريقتين من طرق تنظيم الشبق فى الماعز البلدى المحلية بمصر . استخدم فى هذه الدراسة ٤١ عنزة بلدى قسمت إلى ثلاث مجموعات ، المجموعة (١) ماعز مقارنة (كنترول) بدون معاملة ، المجموعة (٢) عوملت الماعز بحقنتين بروستاجلاندين بفاصل ١١ يوم ، المجموعة (٣) عوملت الماعز بالحقن اليومى بـ ٢٥ مل بروجستيرون/معزة/يوم لمدة ١١ يوم وفى اليوم قبل الاخير تم حقن الماعز بجرعة واحدة (٥٠٠ وحدة دولية) من هرمون الفرس الحامل . اظهرت الماعز حدوث شبق بنسبة ٧٨,٥٧% و ٩٢,٨٥% للمعاملتين الهرمونيتين (البروستاجلاندين ، البروجستيرون) على الترتيب. تم تقدير متوسط حدوث بداية الشبق من اخر معاملة هرمونية للماعز المعاملة بالبروجستيرون وكذا اخر معاملة بالبروستاجلاندين. أظهرت النتائج بداية حدوث الشبق مبكرا وبفروق معنوية للماعز المعاملة بالبروجستيرون + هرمون الفرس الحامل عن تلك المعاملة بالبروستاجلاندين وكذا كانت فترة استمرار الشبق للماعز المعاملة بالبروجستيرون + هرمون الفرس الحامل أطول بفروق معنوية عن تلك المعاملة بالبروستاجلاندين. أوضحت النتائج ان معدل الخصوبة كان أعلى للماعز المعاملة بالبروجستيرون + هرمون الفرس الحامل (٨٥,٧١%) عن تلك المعاملة بالبروستاجلاندين (٥٧,١٤%) بينما كانت الماعز فى المجموعة الضابطة (الكنترول) وسط بينهما ٧٦,٩٢%. كانت فترة الحمل أقصر فى الماعز المعاملة بالبروجستيرون + هرمون الفرس الحامل عن تلك المعاملة بالبروستاجلاندين أو الكنترول. كان عدد المواليد / عنزة ملقحة عاليا معنويا الماعز المعاملة بالبروجستيرون + هرمون الفرس الحامل عن تلك المعاملة بالبروستاجلاندين أو الكنترول.

خلصت هذه الدراسة بأن استخدام المعاملة بالبروجستيرون + هرمون الفرس الحامل عند تنظيم الشياع والتبويض فى الماعز البلدى أعطى اعلى معدل خصوبة وتوائم عن تلك المعاملة بالبروستاجلاندين جرعتين بينهما ١١ يوم.