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REPRODUCTIVE PERFORMANCE OF RAHMANI EWES IN BREEDING AND NON-BREEDING SEASONS AACCORDING TO DIFFERENT HORMONAL PROTOCOLS

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ABSTRACT

Therty Rahmani ewes used to study the possibility of inducing estrous and ovulatory activities by hormonal treatments during the breeding season (September) or non-breeding season (May) for the purpose of improving fertility. Ewes were divided into three similar groups (10 heads/group) for each breeding season according to the type of hormonal treatments**.** Fresh diluted semen was used for AI, semen was deposited into the cervix. Results showed that estrus rate was higher (P<0.05) for T1 and T3 than T2, being the highest for T3 and in breeding than in non-breeding seaon. Estrus rate of treated ewes ranged from 60-100% in breeding season (September) and 40-90% in non-breeding season. Lambing rate was higher (P<0.05) for T3 and T1 than T2 in breeding and non-breeding season. Progesterone levels in all treatments in both seasons showed gradual increase in pregnant and non-pregnant animals from -2 to 3 days of sponge insertion to 7-12 days after sponge withdrawal, then showed additional increase in pregnants, while decreased less than 1 ng/ml in non-pregnants. The cost of one lamb production was the lowest for T3 comparing with T1 and T2, in breeding and non-breeding seasons. Attaining an adequate response in lambing rate and litter size of Rahmani ewes could be with the association of long P4 protocols (12 day) and 500 IU (in breeding season) or 700 IU (in non-breeding season) of hCG from the economic point.

INTRODUCTION

Reproductive seasonality is an adaptation mechanism developed in response to environmental changes and food availability across a given year. Estrus and ovulation synchronization in small ruminants can be controlled by diffrent means, such as the administration of progesterone (P4) plus gonadotropins, such as equine chorionic gonadotropin (eCG), human chorionic gonadotropin (hCG) and pregnant mare serum gonadotropins (PMSG) to counteract reproduction seasonality (Contreras-Villarreal *et al.*, 2016), using either artificial insemination (AI) or natural mating (Martinez-Ros *et al.*, 2019a). In temperate regions of the world from regions 25^{o} N, to the higher latitudes >40^{o} N and S, reproductive seasonality occurs and negatively affects products for marketing of sheep and goats (Gonzalez-Bulnes *et al.*, 2020). The majority of ewe breeds differ in reproductive behavior depending on season changes, latitude/longitude, the length of the photoperiod and other factors (Silva *et al.*, 2020).

Synchronization or induction of estrus in ewes is an interesting tool for increasing the pregnancy rate. Modern husbandry of ewes has improved the efficiency of extensive production and controlled the reproductive process for intensive production. Basically, the synchronization of estrus in ewes focuses on the manipulation of the estrous cycle (Zonturlu *et al.*, 2011), either at the luteal or the follicular phase. The success of reproductive technologies is largely dependent on the interaction between the ovarian status and the hormonal treatments needed for allowing their application; progesterone for inducing and synchronizing estrus occurrence and gonadotrophins for inducing follicular growth and ovulation (Daly *et al.* 2020). Intravaginal progestagen sponge, followed by PMSG injection was carried out to synchronize estrus during the breeding season (Menegatos *et al.*, 1995), or to induce oestrus out of season (Zarkawi *et al.*, 1999). Thus, the objective of this study was to evaluate the impact of three different protocols for estrus synchronization during breeding and induction of estrus in non-breeding seasons on reproductive performance of Rahmani ewes.

MATERIALS AND METHODS

Therty Rahmani ewes of the flock at Mehalet Mousa Experimental Station (2-7 years

old and 50-55 kg body weight) were used to study the possibility of inducing estrous and ovulatory activities by hormonal treatments during anoestrus (May breeding season) and synchronization of estrus and ovulation during the breeding season (September breeding season) for the purpose of improving fertility.

Animals were housed in semi-open sheds and fed concentrate feed mixture and roughages all the year-round plus 5 kg Egyptian clover during winter feeding or 1.5 kg clover hay during summer feeding (according to NRC (2007) requirements) with free access to trace mineralized salt lick blocks and drinking water all time.

Ewes were divided into three similar treatment groups according to age, body weight and physiological condition (10 heads/group) as follows:

First group (T1): ewes treated with 45 mg Cronolone vaginal impregnated sponges (Flugestone acetate, FGA; Intervet International B.V. Boxmeer-Holland). The sponge inserted and remained intravaginal for 12 days. Each ewe intramuscularly injected with 500 IU PMSG (FOLLIGON, Intervet International B.V. Boxmeer-Holland) and 0.7 mL $PGF_2\alpha$ (Estrumate, Coopers Animal Health LTD, Berkhamsted-England) on the day of sponge withdrawal (Day 12) during the breeding season or 700 IU PMSG 48 h before sponge withdrawal (Day 10) and 0.7 mL $PGF_2\alpha$ on the day of sponge withdrawal (Day 12) during the non-breeding season. Each mL of Estrumate contained 263 µg Cloprostenol Sodium equivalent to 250 µg Cloprostenol.

Second group (T2): ewes treated with 45 mg Cronolone vaginal impregnated sponges. The sponge inserted and remained intravaginal for 12 days. Each ewe was intramuscularly injected with 1 mL GnRH analogue (Receptal, Intervet International B.V. Boxmeer-Holland) and 0.7 mL $PGF_2\alpha$ on the day of sponge withdrawal (Day 12) during the breeding season or 1 mL GnRH analogue 48 h before sponge withdrawal (Day 10) and 0.7 mL $PGF_2\alpha$ on the day of sponge withdrawal (Day 12) during the non-breeding season.

Third group (T3): ewes treated with 45 mg Cronolone vaginal impregnated sponges. The sponge inserted and remained intravaginal for 12 days. Each ewe was intramuscularly injected with 500 IU Chorionic gonadotrophin (Human Chorionic gonadotrophin, hCG 5000 IU, Eipico, El-Nile Company, Egypt) and 0.7 mL $PGF_2\alpha$ on the day of sponge withdrawal (Day 12) during the breeding season or 700 IU hCG 48 h before sponge withdrawal (Day 10) and 0.7 mL $PGF_2\alpha$ on the day of sponge withdrawal (Day 12) during the non-breeding season.

The experimental design of different hormonal protocols in breeding and non-breeding seasons are illustrated in Fig. 1.

Semen processing:

Fresh diluted semen was used for AI. Semen had been collected and diluted (1 semen: 4 extender) just before insemination. Collection of semen carried out by the use of artificial vagina. The Tris-yolk extender used for the extension of fresh semen. The extender was prepared and kept at 5°C for 24 h before semen dilution. Each 100 mL of Tris-yolk extender consisted of 3.028 g Tris, 1.675 g citric acid, 1.250 g glucose, 5 mL egg yolk, 1 mL antibiotics including 100.000 IU penicillin and 100.000 IU streptomycin, then distilled water was added up to 100 mL. All chemicals used for preparation of extender purchased from Sigma chemical company, P.O. Box 14508, ST. Louis, MO 63178 USA.

The extender gently shacked and warmed up to 37°C using a water bath before semen dilution. Immediately after semen collection the volume was measured and liquors of raw semen were taken for determination of sperm motility according to the method described by Bane (1952). Only ejaculates of ≥70% initial motility were diluted (1 part semen: 4 parts extender) at 37°C. Sperm concentration was estimated as 300 x 10^6 sperm/ml diluted semen and sperm motility remained over 70% before use. Insemination carried out using a simple inseminating pipette with fine blunt bent end and a vaginal speculum. Semen deposited into the cervix as far as possible (about 1 cm).

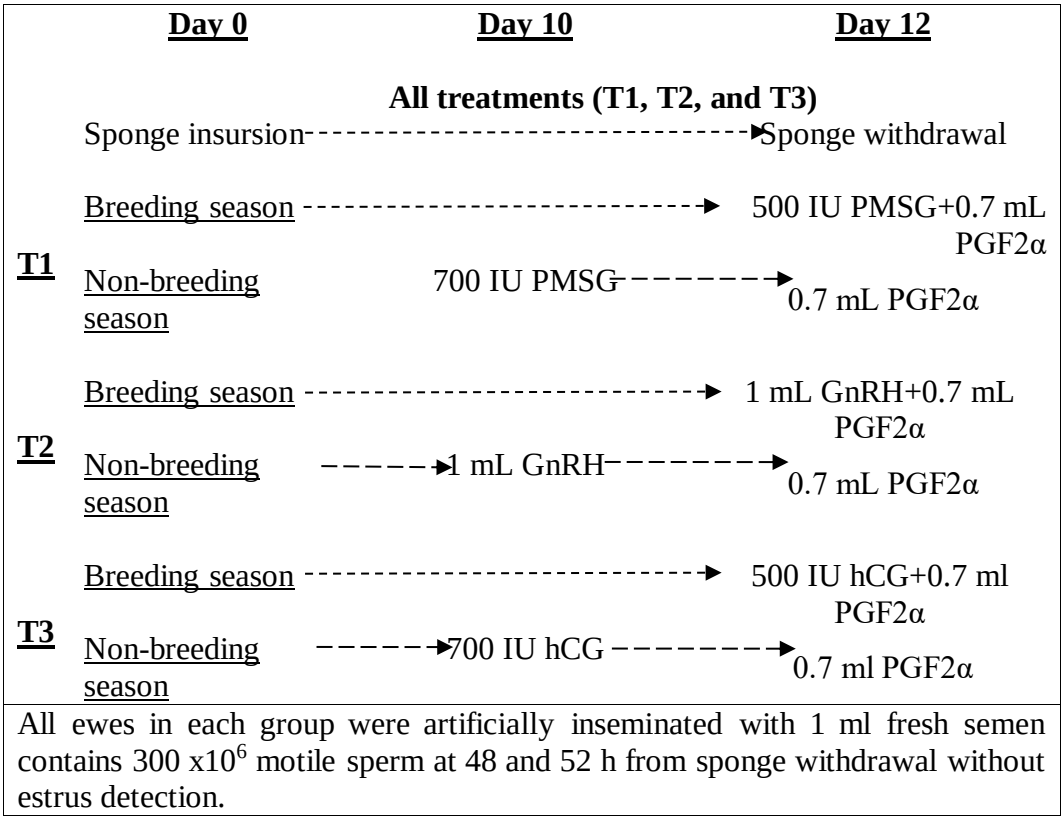

Fig. 1. The experimental design of different hormonal protocols in breeding and non-breeding seasons.

Blood sampling:

Blood samples taken via the jugular vein from all ewes in each of experimental group at 8 am into evacuated heparinized tubes (10 mL). Samples of each treatment group were taken on days -2 (pre-treatment), 0 (sponge inserted), 3, 7, 10, 11, 12, 32, 33 and 34 of sponge insertion. Just after sampling, the blood samples separated to obtain plasma by centrifugation of blood at 2500 rpm for 15 min. Plasma was packed in labeled plastic tubes and stored at -20°C until assayed later for progesterone (P4) concentration. Concentration of P4 was determined based on competition reaction (Bojanic *et al.*, 1991) on samples of five selected ewes (3 ewes responde to lambing and one or two non-responded ewes) of each treatment group.

Statistical analysis:

Data were analyzed using (SAS. 2007), GLM analysis of variance, for study the effect of treatment (T1, T2 and T3) within each season or the differences between both seasons (overall mean). The statistical model $Y_{ij}= \mu + A_i + B_j + e_{ij}$ was used, where, Y_{ij} : the vector of observation, μ: overall means, A_i : the effect of i^{th} season (i = (1) breding season and (2) non-breeding season, B_j: effect of j^{th} treatment (j = 1, 2 and 3), and e_{ij}: random error associated. Duncan Multiple Range test (Duncan, 1955) was used to get the mean separations among treatments.

RESULTS AND DISCUSSION

Effect of hormonal treatments (T1, T2 and T3) within each season and effect of season on rate, onset, and duration of estrus are presented in Table 1. In each season, estrus rate was higher ($P<0.05$) for T1 and T3 than T2, being the highest for T3 and in breeding than in non-breeding seaon. Estrus rate of treated ewes ranged from 60-100% in breeding season (September) and 40-90% in non-breeding season. Although the estrus rate was lower in T2 than in T1 and T3 in both breeding seasons, onset of estrus was the earliest ($P<0.05$) and estrous duration was the shortest in T2 but did not differ

significantly from T1 at breeding season. As affected by season, onset of estrus was earlier (30.6 hr) ($P<0.05$) in breeding than non-breeding season (41.8 hr), but estrous duration was not affected by season.

The most used hormonal treatments in estrous syncronization protocols for sheep are those based on P4 or its analogues (Abecia *et al.* 2012). Controlled internal drug release (CIDR) is an intravaginal device impregnated with 0.3 g of natural progesterone (Wheaton *et al.* 1993) designed for use between 12 and 14 days in sheep (Viñoles *et al.* 2001). The device inhibits GnRH secretion and consecuently prevents the release of gonadotropins, especially luteinizing hormone (Rubianes *et al.* 2003).

Table 1. Estrus rate, onset, and duration in response to hormone treatment in ewes of treatment groups during the breeding and non-breeding season.

Season	Treatment	Estrus		
		Rate (%)	Onset (h)	Duration (h)
Breeding (September)	T1 (PMSG)	(9/10) 90^{a}	30.3±0.70^{ab}	30.8±0.88^{ab}
	T2 (GnRH)	(6/10) 60^{b}	28.7±1.22^{b}	27.7±4.99^{b}
	T3 (hCG)	(10/10) 100^{a}	32.7±0.41^{a}	32.5±1.81^{a}
	Overall mean	(25/30) 83.3^{A}	30.6±0.77^{B}	30.3±2.56
Non-breeding (May)	T1 (PMSG)	(8/10) 80^{a}	40.4±1.04	31.4±0.57
	T2 (GnRH)	(4/10) 40^{b}	43.5±2.13	30.3±1.52
	T3 (hCG)	(9/10) 90^{a}	41.6±1.04	31.8±0.57
	Overall mean	(21/30) 70.0^{B}	41.8±1.40^{A}	31.1±0.88

^{a} and ^{b}: Means of treatments bearing different small letters within each season differ significantly ($P<0.05$).

^{A} and ^{B}: Overall means for each season bearing different capital letters differ significantly ($P<0.05$).

Once the device is removed, an injection of equine chorionic gonadotropin (eCG) is applied (Abecia *et al.* 2011), which has an effect of follicle-stimulating hormone (FSH) and LH to enhance ovulation (Martinez-Ros *et al.* 2019b). The present results indicated a superior estrus response obtained in association with PMSG given 2 days in advance of FGA-sponge removal as early reported by East and Rowe (1989), who used an intravaginal sponge containing 30 mg FGA for 16 days plus an injection of 250 IU PMSG two days before sponge removal. They obtained higher estrus rate, being 95% during the transition from non-estrus to breeding season in Toggenburg, Alpine, Saanen and Anglo-Nubian goats. Stimulation of follicular growth in the ovary by exogenous PMSG led to higher estrus response by anestrus goats only in the intravagnial sponge treatment (Greyling and Van Niekerk, 1991). The present results indicate that this was likely to happen in response to FGA-sponge treatment. Meanwhile, results of GnRH given (T2) at may indicate that GnRH as an estrous synchronizing agent is only effective during breeding season. It postulated that this GnRH might cause follicular growth only in active ovaries. In consistent with our results, Martinez-Ros *et al.* (2019a) obtained estrus presentation at 33.8 h with an interval of 24-40 h by using seven-day protocols with new CIDR associated with 5 mg of prostaglandin and 400 IU of eCG. Similar results were obtained by Biehl *et al.* (2019) using 300 IU of eCG. They found that mean of estrus occurrence was 34.9 h, with the highest concentration of presence between 36 and 41.9 h. In the present study, the use of eCG reduces the interval to ovulation by enhancing the onset of estrus (Cox *et al.*, 2012) by stimulating the recruitment and maturation of follicles and oocytes (Manes and Ungerfeld, 2015). With lower eCG doses, gonadotropin stimulation is reduced. This led Cox *et al.* (2012) to notice the beginning of estrus at 32.8 h when using 350 IU of eCG, whereas in sheep with no doses of eCG, they had a wider interval (45.3). Bazzan *et al.* (2013) observed onset of estrus between 24 and 72 h using 200 IU of eCG with an average of 48 h.

In our study, there is a successful rate of estrus in the non-breeding season, but this result was higher with late incidence and longer duration in the non-breeding season in comparison with the breeding season. In this respect, Pierson *et al.* (2001) synchronized estrus in Dwerf goats using MAP-sponges + eCG + PG during different times of the year. They found different intervals from sponge removal to onset of estrus, being 25.0, 28.9 and 40.9 h during November, July and March, respectively.

According to the present results, the use of P4 + gonadotropin (PMSG or hCG) is useful for increasing estrus response of synchronized ewes in breeding season or estrus induction in anestrous in non-breeding season, which is useful especially when timed insemination protocols are implicated.

Fertility and lambing rate:

Lambing rate and litter size of ewes in response to different hormonal treatment in breeding and non breeing seasons are presented in Table 2 which indicate that lambing rate (based on total number of ewes) was higher ($P<0.05$) for T3 and T1 than T2 in breeding and non breeding season, while overall mean was non significantly higher in breeding than in non breeding season, based on estrus, lambing rate was not affected by treatment in breeding season being the highest for T3, but was higher ($P<0.05$) for T1 and T3 than T2 in non breeding season, with non significant differences beween both season. It is of interest to note that all ewes responded to estrus with T3 in non-breeding season were lambed. Litter size of ewes was not affected significantly by treatment or season, but it was the highest for T3 in breeding season and wth T1 in non-breeding season, and also in breeding than in non-breeding season.

Table 2. Fertility (%) in response to hormone treatment in ewes of different seasons.

Season	Treatment	Fertility (%)		Total number of lambs born	Litter size
		Total ewes	Ewes in estrus		
Breeding (September)	T1 (PMSG)	(8/10) 80^{a}	(8/9) 88.9^{a}	10	1.25
	T2 (GnRH)	(5/10) 50^{b}	(5/6) 83.3^{b}	6	1.20
	T3 (hCG)	(9/10) 90^{a}	(9/10) 90.0^{a}	12	1.33
	Overall mean	(22/30) 73.3^{A}	(22/25) 88.0	28	1.27
Non-breeding (May)	T1 (PMSG)	(7/10) 70^{a}	(7/8) 87.5^{a}	8	1.14
	T2 (GnRH)	(3/10) 30^{b}	(3/4) 75.0^{b}	3	1.00
	T3 (hCG)	(9/10) 90^{a}	(9/9) 100^{a}	10	1.11
	Overall mean	(19/30) 63.3^{B}	(19/21) 90.4	21	1.10

$^{a \text{ and } b}$: Means of treatments bearing different small letters within each season differ significantly ($P<0.05$).

$^{A \text{ and } B}$: Overall means for each season bearing different capital letters differ significantly ($P<0.05$).

In the breeding season of the ewe, GnRH (Buserlin) induced LH surge causing ovulation or luteinization of the ovarian follicles (Beck *et al.*, 1996). During seasonal anoestrus, the occurrence of LH rise, and hence ovulation, appeared to be prevented by a heightened response to estradiol negative feedback (Goodman *et al.*, 1981). Alternatively, the absence of response to GnRH treatment out of the breeding season may be related to the absence of progesterone priming effect during the transition period, immediately before the breeding season (Legan *et al.*, 1985). It shown that sufficient priming of progesterone is

necessary for sensitization of the ovary to LH discharges after inactivity. It is possible that progesterone priming may exert its beneficial effect on subsequent luteal function, indirectly through the hypothalamic-pituitary axis, by suppressing pulsatile LH secretion. This might arrest follicle development to an extent that all potential ovulatory follicles are effectively at an appropriate stage of development to be able to fully response to the GnRH-induced follicular phase and develop into normal CLs after ovulation. The effect of progesterone may also be exerted directly at the level of the follicle to alter its ability to respond to gonadotrophin stimulation (e.g., through intra-ovarian growth factors), thereby ensuring normal luteal development after ovulation (Haresign *et al.*, 1996).

The exogenous progesterone used to imitate the role of the corpus luteum for the control of the estrous cycle, avoiding the occurrence of ovulations during progesterone supplementation and allowing them at progesterone removal. However, such protocols neglected to take into account the follicle-destined to release an oocyte able to result in a pregnancy and to develop a corpus luteum supporting such pregnancy. In fact, 12 to 14 days of treatment may affect the quality of preovulatory follicles (Viñoles *et al.*, 1999) and, therefore, the fertility of oocytes and the function of corpora lutea (Berlinguer *et al.*, 2007). The basis for the administration of progesterone is the decrease in secretion of luteinizing hormone (LH) that prevents the occurrence of estrus, the preovulatory LH surge, and ovulation until the progestative treatment is withdrawn (Goodman and Karsch, 1980). The decrease in LH secretion induced by exogenous progesterone causes large follicles (gonadotrophin-dependent follicles), 4 mm in size in the case of sheep (González-Bulnes *et al.*, 2004) present in the ovaries to become atretic, allowing follicular turnover and the emergence of a new follicular wave (Leyva *et al.*, 1998). However, sometimes, progesterone release after 12–14 days of treatment is too low to adequately suppress LH. The failure in suppressing LH secretion causes abnormal follicular development with large, persistent follicles (Viñoles *et al.*, 1999). Afterward, the ovulation of these aged follicles affects fertility (Ungerfeld and Rubianes 2002).

Progesterone concentration (ng/ml):

Table (3) shows progesterone levels before and during treatment (FGA-sponge) in breeding and non-breeding season. Progesterone levels in all treatments in both seasons showed gradual increase in pregnant and non-pregnant animals from -2 to 3 days of sponge insertion to 7-12 days after sponge withdrawal, then showed additional increase in pregnants, while decreased less than 1 ng/ml in non-pregnants. These results indicate positive impact of all treatments on increasing P4 level of ewes during non-breeding season. In Rahmani ewes of the same flock, plasma progesterone levels during anestrus were <0.5 ng/ml in May and <0.1 ng/ml in March/April to late June and fluctuated around 0.45 (0.02-0.71 ng/ml) up to the onset of the breeding season (Gabr 1986)**.**

Progesterone concentrations increased to >0.80 ng/ml after insert sponge (day -2 to 3), while on days 7-12, subluteal concentrations >2 ng/ml were obtained from sampled ewes; this agrees with Wheaton *et al.* (1993), who stated that P4 concentration increase dramatically after CIDR inserted. This increase in P4 is required to disinhibit GnRH secretion and trigger the release of gonadotropin, inducing the onset of estrus and ovulation (Amiridis and Cseh, 2012). This indicates the positive relationship between progesterone level during treatment and the resultant fertility, which is going in line with the hypothesis that an inadequate progestagen level on the day of sponge removal may be responsible of the variability in the occurrence of estrus after hormonal treatment of anestrus dairy goats (Gordon, 1996). The variability between animals in timing of estrus after administration of a synchronization treatment seems to explain the low rate of fertility in goats inseminated at a predetermined time after sponge removal (Freitas *et al.* 1997). Nevertheless, Freitas *et al.* (1994) tested such hypothesis and found that a higher level of progesterone at the end of treatment led to some loss of fertility

Table (3): The mean of progesterone concentration (ng/ml) in some stages for ewes under different hormonal treatment.

			P4 level		
	Treatment	Pregnancy status	-2 day To 3 day	Day 7 to day 12 (sponge)	Day 32 to 34 after sponge withdrawal
Breeding season (September)	T1 (PMSG)	+ (3)	1.86±0.01	2.60±0.22	4.87±0.19
		- (2)	1.08±0.01	3.25±0.32	0.59±0.90
	T2 (GnRH)	+ (3)	1.08±0.01	2.16±0.19	3.74±0.34
		- (3)	1.17±0.02	2.62±0.05	0.77±0.05
	T3 (hCG)	+ (1)	0.99±0.00	3.15±0.00	4.36±0.00
		- (2)	1.10±0.00	2.33±0.00	0.42±0.00
Non-breeding season (May)	T1 (PMSG)	+ (3)	0.83±0.01	2.49±0.33	4.89±0.03
		- (3)	0.90±0.05	3.67±0.30	0.87±0.03
	T2 (GnRH)	+ (3)	1.04±0.01	2.60±0.22	4.13±0.03
		- (3)	0.97±0.01	2.60±0.22	0.73±0.01
	T3 (hCG)	+ (3)	0.95±0.01	2.28±0.21	3.89±0.03
		- (1)	0.85±0.00	3.39±0.00	0.44±0.00

(+) pregnant, (-) not pregnant

. With respect to GnRH-treatment, where the response occurred, there was wide difference in progesterone level during treatment between does conceived and those failed to conceive in both seasons in favor of pregnancy. This may referred to the smaller sizes of the ovulated or luteinized ovarian follicles followed GnRH treatment during seasonal anoestrus than during the breeding season. Follicular sizes in the ewe were smaller in the anoestrus than in the breeding season (Mallampati *et al.*, 1971) and their development is inhibited out of season (Wood and Foster, 1992). This may be explained as a result of possible higher luteal activity caused by higher pituitary LH output as the animal approaches and goes into the breeding season.

From artificial insemination time to the attainment of progesterone plateau (sustainable high levels) in pregnant ewes, the average progesterone level ranged from 3.74 to 4.87 ng/ml on the breeding season and 3.89 to 4.89 ng/ml on the non-breeding season. This study was designed to test the efficiency of a recently developed method for synchronization of ovulation using a protocol of combined treatment with FGA-sponge, PGF2α and PMSG, GnRH or hCG. In both treatments, the pre-determined time based artificial insemination has proven as practical and less costing, since ovulation in response to treatment.

In the breeding season, high fertility rates have been resulted due to both treatments with CIDR or FGA-sponge + PMSG and CIDR or FGA-sponge + hCG resulted in higher fertility and high synchronization. So, it recommended in the breeding season to use the present protocol for synchronization of ovulation and, subsequently, lambing with insemination to be based on pre-determined time.

On experimental days 7 and 12, there was an increase in the concentration of P4 (>1 ng/mL) in all ewes, showing that ovulation was induced in the three treatments, although P4 concentrations were higher in 10 d CIDR treatment. The highest P4 concentration was observed at day 7 with the 10 d CIDR 300 IU eCG ($P<0.05$) ewes and then reached a plateau on days 11, 13, and 15 with no difference among groups ($P>0.05$). At day 17, an evident reduction

in the mean concentration of P4 was observed in ewes from both 12 d CIDR treatments and 10 d CIDR-400 IU eCG treatment (Arosh *et al.*, 2004). Bazer (2013) stated that 12 to 13 days after mating is a critical period in sheep gestation due to the beginning of corpus luteum regression.

Concerning the lower response to FGA-sponge + GnRH out of the breeding season, it may be a matter of dominance of the estradiol negative feedback, absence of progesterone priming effect or both. The question emerging here is what would be the response if the dose of GnRH is increased, and/or if progesterone is used for its priming effect? More studies needed to elucidate these issues.

Economic efficiency:

The economic efficiency of the experiment (Table 4) was calculated according to the lamb production, the cost of one lamb

Table (4): Effectiveness of pre-determined time based insemination in treated ewes under different hormonal treatments.

	Treat.	N	Ewes showed estrus				Economic efficiency (EP)			
			Total	Ewes lambed			Total cost of hormone treatment	Cost lambs		
				N	%			Lambs born	Price of one lamb	%
					(1)	(2)				
September (Breeding season).	T1	10	9	7	70^{a}	77.8^{ab}	2170	10	217	10.0
	T2	10	6	5	50^{b}	83.3^{b}	1320	6	220	16.7
	T3	10	10	8	80^{a}	80.0^{a}	1260	12	105	8.33
Overall		30	25	20	80.0^{A}	88.0	4750	28	169.6	3.57
May (non-breeding season)	T1	10	8	7	70^{a}	87.5^{a}	2570	8	321	12.5
	T2	10	4	3	30^{b}	75.0^{b}	1320	3	440	33.3
	T3	10	9	8	80^{a}	88.8^{a}	1296	10	129	9.95
Overall		30	21	18	60.0^{B}	85.7	5186	21	246.9	4.76

$^{a \text{ and } b}$: Means of treatments bearing different small letters within each season differ significantly ($P<0.05$).

$^{A \text{ and } B}$: Overall means for each season bearing different capital letters differ significantly ($P<0.05$).

(1) Lambed ewes /total ewes (2) Lambed ewes/ewes showed estrus

Price of hormone treatments: One Sponge = 110 Egyptian Pound (EP), 10 ml Estrumate = 100 EP, 1000 IU PMSG = 200 EP, 10 ml GnRH = 150 EP and 5000 hCG = 90 EP.

production was the lowest for T3 comparing with T1 and T2, in breeding and non-breeding seasons, and as overall mean during the breeding season as compared to non-breeding season.These results mean that the conceivable ewes due to FGA-sponge treatment out of the breeding season are confined to those showing estrous behaviour. With time advance, the conceivability is being associated with both ewes in estrus or in anestrus, partly during the transition period and fully in the breeding season. It is interesting to note that GnRH-treatment (T2) had small effect on the treated ewes at breeding and non-breeding season since

it is clear that, T3 (hCG) had the hieghest fertility and lowest cost to produce one lamb.

It is important to note that, in almost all studies, hormonal methods are evaluated on: (1) their efficiency to synchronize estrus and ovulation. (2) fertility (3) economic efficiency. The ultimate aim of any estrous synchronization method is to allow artificial insemination at a predetermined time after the end of treatment. When fertility is low, interpretation will be that AI has been performed too early, with oocyte arriving in the oviduct after the death of spermatozoa, or too late so that the quality of oocyte depressed.

Conclusion:

In the present study, we obtained an adequate response of lambing rate and litter size for Rahmani ewes with the association of long P4 protocols (12 day) and 500 IU (in breeding season) or 700 IU (in non-breeding season) of hCG considering the economic point.

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الاداء الانتاجى للنعاج الرحمانى داخل وخارج موسم التناسل باستخدام طرق مختلفة من المعاملات الهرمونية

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1 معهد بحوث الانتاج الحيوانى 2 كلية الزراعة ، جامعة المنصورة

تم استخدام 60 نعجة رحمانى حيث تم استحداث وتنظيم الشبق والتبويض باستخدام المعاملات الهرمونية داخل وخارج موسم التناسل لتحسين نسبة الخصوبة. قسمت النعاج الى 3 مجموعات متساوية (10 نعاج/معاملة) لكل موسم تناسل حسب المعاملة الهرمونية وتم التلقيح اصطناعيا بسائل منوى مخفف طازج فى عنق الرحم. النتائج المتحصل عليها داخل موسم التناسل اوضحت ان معدل الشبق كان اعلى فى المعاملة T3, T1 عن T2 وكانت اعلاهم T3 سواء داخل او خارج موسم التناسل. معدل الشياع تراوح بين 60-100% داخل موسم التناسل و40-90% خارج موسم التناسل . معدل الولادة كان اعلى معنويا فى المعاملة T3, T1 عن T2 فى داخل او خارج موسم التناسل. مستوى هرمون البروجستيرون فى كل المعاملات فى كلا من موسمى التناسل كان اعلى فى النعاج العشار عن تلك الغير عشار بداية من اليوم -2 الى 3 من تركيب الاسفنجات المهبلية و7-12 يوم بعد نزع الاسفنجات كما كان هناك ارتفاع فى النعاج العشار بينما تناقص الى 1 نانوجرام/مل فى النعاج العشار. التكلفة لانتاج مولود كانت اقل فى T3 مقارنة بالمجموعتين T1, T2 سواء داخل او خارج موسم التناسل . يستنتج من البحث انه للحصول على استجابة عالية فى معدلات الولادة ومعدل التوائم للنعاج الرحمانى يمكن إستخدام الاسفنجات المهبلية لمدة 12 يوم مع حقن 500 وحدة دولية hCG داخل موسم التناسل أو 700 وحدة دولية hCG خارج موسم التناسل وذلك هو الافضل من الناحية الاقتصادية.