J. Agric. Sci. Mansoura Univ., 29(9): 4875 - 4886, 2004

OSTROUS ACTIVITY OF DAMASCUS DOES TREATED WITH GnRH-PGF$_{2\alpha}$-GnRH PROTOCOL DURING DIFFERENT MONTHS OF THE YEAR.

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ABSTRACT

A total of 70 Damascus goats (1.5-8 years old) taken from Sakha Research Station, Kafr El-Sheikh Governorate, belonging to the Animal Production Research Institute was used to study the possibility of inducing oestrous and ovarian activity by hormonal treatment during anoestrus, and synchronization of oestrus and ovulation during the breeding season for the purpose of improving fertility and multiple kidding. New protocol for GnRH treatment was assessed during different times of the year. Seven experiments were carried out during different times of the year throughout the period from September 1999 to August 2002. Does in each experiment were divided into two similar groups according to age, body weight and physiological condition. In the first group (treated), does were i.m. injected (Day 0) with 1 ml GnRH analogue, followed 7 days later by i.m. injection with 0.7 ml PGF$_{2\alpha}$. A second dose of 1 ml GnRH analogue was given on day 9, and artificial insemination of all treated does was carried out 24 h later. Does in the 2nd group were allowed for natural mating. They were exposed to fertile bucks from the time contemporary to that of the start of hormonal treatment up to the end of the breeding season (end of January, experiments 1, 3 and 5) or for a period covering 2 cycles (experiments 2, 4, 6 and 7). Occurrence of oestrus following treatment, ranged from zero% in deep anoestrus season to 70% in the breeding season. Gradual decrease in incidence of oestrous occurred with advance in age. Treated does were distributed almost consistently over 28 h in onset of their oestrus. Values of fertility rate in treated group was highest (90.9%) in September, while it was (40%) in early August and (60%) in late August. Out of the breeding season, no response occurred in treated does. Does of control group conceived only in September (breeding season) with conception rate, being 47.6% and significantly ($P<0.05$) deviating from that of treated groups. Treatment during the breeding season (September), in addition to improving fertility rate shortened the duration of kidding to 37% of that in control group (7 and 19 d, respectively). Treatment during the transition period to the breeding season (early and late August) resulted in 1-2 months earliness in kidding time. According to results of the present study, it could be recommended to use the present protocol of GnRH treatment during the breeding season for synchronization of ovulation and, subsequently, kidding with insemination to be based on pre-determined time. GnRH is time saving (10 day), resulting in high fertility rate (90.9%). Hormone treatment can be used in the transition period to the breeding season (August) to enhance kidding dependent upon the requisite and economics of Damascus kid and milk production needed. If out of season breeding is settled, GnRH –treatment is not recommended to be used and artificial insemination based on either overt oestrus or pre-determined time.

Keywords: Goat, GnRH, PMSG, PGF$_{2\alpha}$, oestrus, kidding rate.

INTRODUCTION

Small ruminants play significant role in the agricultural economy and many efforts have been made to improve their reproductive performance throughout increasing kid production (number of kids per doe kidded and the number of kiddings per year). This relies on utilizing the animal at different times of the year.Understanding the seasonality of reproduction in goat females and its control under the local conditions is particularly important in planning breeding programs and allowing maximum utilization of these animals throughout their productive life.

It is interest to note that mating season of Damascus goats occurs late in August through early November and normally does kid once each year in Syria (Zarkawi *et al.*, 1999), in Cyprus (Constantinou, 1981) and in Egypt (Shalaby *et al.*, 1998). It is now well established that various forms of hormonal treatment or light manipulation can be effective in reducing such seasonal effects on reproduction in goats. The effectiveness of such measures in practice is likely to vary according to age, breed and a variety of environmental factors (Jainudeen and Hafez, 1993).

GnRH alone or in combination with $PGF_{2\alpha}$ was successfully used in inducing ovulation in cattle (Ganah, 2000) and buffaloes (Hegazy, 2001). In goats, however, no available information were found on the use of GnRH in inducing oestrus during breeding or non-breeding season. Therefore, the present study aimed to increase Damascus kid production per doe per year through increasing number of kiddings per year using protocol of GnRH-treatment at different times of the year.

MATERIALS AND METHODS

This study was carried out at Sakha Research Station, Kafr El-Sheikh Governorate, belonging to the Animal Production Research Institute, Ministry of Agriculture.

A total of 70 Damascus does (1.5-8 years old) from the flock of Sakha Experimental Station was used in this study. Does were housed in semi-open sheds and were fed concentrate feed mixture and roughages according to NRC requirements for production of 1-2 kg milk/head/day (NRC, 1984). Seven experiments were carried out during different times of the year throughout the period from September, 1999 to August, 2002 as in the following table.

Exp.	Season	Period	No.of does		Type of semen
			T	C	
1	Breeding (Sep. 1999)	1/9/1999 to 31/1/2000	22	21	Fresh
2	Non-breeding (May 2000)	20/4/ 2000 to 30/5/2000	10	10	Fresh
3	Breeding (Late Aug.2000)	7/8/2000 to 31/1/2001	10	10	Frozen
4	Non-breeding (May 2001)	15/4/2001 to 1/6/2001	10	7	Frozen
5	Non-breeding (early Aug. 2000)	10/7/2001 to 31/1/2002	10	10	Frozen
6	Non-breeding (June 2002)	28/5/2002 to 1/7/2002	10	10	Frozen
7	Non-breeding (July 2002)	25/6/2002 to 1/8/2002	10	10	Frozen

T: Treated does C: Control does

Does in each experiment were divided into two similar groups according to age, body weight and physiological condition as follows: In the first group (T), does were i.m. injected (Day 0) with 1 ml GnRH analogue (Receptal, Intervet International B.V. Boxmeer-Holland), followed 7 days later by i.m. injection with 0.7 ml $PGF_{2\alpha}$ (Estrumate). A second dose of 1 ml GnRH analogue was given on day 9, and artificial insemination of treated does was carried out 24 h later. Each ml of Receptal contained 0.0042 mg Buserelin acetate equivalent to 0.004 mg Buserelin.

The protocol of GnRH treatment for goats in the present study has been based on synchronization of follicular growth through: (1) ovulation of the dominant follicle of the present follicular wave at the injection of 1st dose of GnRH and initiation of new follicular growth wave, (2) lutulysation of the developed CL by $PGF_{2\alpha}$ injection, (3) ovulation of the dominant follicle of the induced (synchronized) follicular wave via second GnRH injection. Does in the 2nd group represented the control (C), which were allowed for natural mating. The control does were exposed to fertile bucks from the time when treatment started in group C up to the end of the breeding season (end of January, experiments 1, 3 and 5) or for a period covering 2 cycles (experiments 2, 4, 6 and 7). During the breeding season, Damascus buck of proven fertility was introduced to does for 35 days and was rested for 7 days and again introduced for another period of 35 days until the end of the experiment.

In each of experiments 1 and 2, fresh diluted semen was used in insemination of treated does. Semen had been collected and diluted just before insemination. Unexpectedly, semen collected during the second experiment was of poor quality. So, semen thereafter was collected and frozen during the breeding season and stored in liquid nitrogen for use during experiments 3 to 7. Semen was prepared according to Maxwell *et al.* (1995) and was frozen according to Evans and Maxwell (1987).

Statistical analysis:

Data were statistically analyzed using SAS (1999) and Chi square' s test. Duncan Multiple Range test (Duncan, 1955) was used to get the mean separations among the effects of seasons, treatment and type of insemination for the studied traits.

RESULTS AND DISCUSSION

Oestrous activity:

Occurrence of oestrus:

Data in table 1 revealed that none of the GnRH-treated does (T) come in oestrus during the non-breeding season (May 2000 & 2001, June 2002 and July 2002). However, relatively low oestrous activity had occurred near or in the breeding season (27.3% in September 1999; 70% in late August 2000 and 20% in early August 2001). The differences were significant ($P<0.05$).

Results may indicate that GnRH is effective only during breeding season, which postulates that GnRH protocol might cause follicular growth only in active ovaries (Hegazy, 2001). However, occurrence of oestrus following GnRH treatment might be considered as reasonable during the transition period (70% in late August) and low in the breeding season (27.3% in September).

Table (1): Oestrus response of treated does of different categories of ages and postpartum in different experiments.

Exp.	Total	Age category (year)						Post partum category (month)					
		<2-4			>4-6			NR			3-7		
		N	R	%	N	R	%	N	R	%	N	R	%
Sep. 1999	22	16	5	33.3^{b}	6	1	16.7^{c}	11	6	54.6^{b}	6	4	66.7^{b}
May 2000	10	5	0	0	5	0	0	9	0	0	-	-	-
L.Aug.2000	10	8	6	75.0^{a}	2	1	50.0^{a}	7	5	71.4^{a}	1	1	100^{b}
May 2001	10	4	0	0	6	0	0	2	0	0	1	0	0
E.Aug.2001	10	3	0	0	7	2	28.6^{b}	3	1	33.3^{c}	-	-	-
June 2002	10	6	0	0	4	0	0	2	0	0	2	0	0
July 2002	10	8	0	0	2	0	0	0	0	0	-	-	-

a, b and c: Means bearing different small letters within the same column differ significantly (P<0.05).
N = treated does R= number of does came in oestrus
NR= does who did not previously kid

In ewes, an injection of 4 mg of the GnRH (Buserelin) followed, 5 days later, by injection of 100 mg of Cloprostenol (Beck *et al.*, 1996); an 11 days double dose $PGF_{2\alpha}$ regimen (Beck *et al.*, 1996) and $PGF_{2\alpha}$ at the end of 8 days progestagen treatment (Greyling *et al.*, 1979) resulted in mating all treated ewes by fertile rams within 3 days post-treatment.

Data in the table 1 show that does of <2-4 y showed higher response than those of >4->6 y in the breeding season with high values recorded only for those of <2-4 y approaching the breeding season (75% in late August). However, only does of >4->6 y responded in early August (28.6%). On the other hand, neither does of <2-4 y nor those of >4->6 y showed oestrous behaviour following GnRH-treatment in May, June, or July.

Occurrence of oestrous bahaviour in response to GnRH-treatment was higher in does having 3-7 months postpartum than those that did not previously kid. Generally, absence of response to GnRH-treatment in May, June and July may be referred to the season rather than age or postpartum categories.

Timing of the onset of oestrus (h):

Data in table 2 indicated the existence of some differences in the timing of onset of oestrus due to time of the year (experiment). It was the latest (P<0.05) in September 1999 (28.7 h) and late August (28.6 h) and the earliest in early August (26.0 h). No significant differences in onset of oestrus occurred between the other seasons. Treated does in most experiments started their oestrus almost consistently around 28 h after end of treatment (Table 2).

Table (2): Average time of oestrus onset (h) after end of treatment and its distribution (%) in treated does in different experiments.

Experiment	N	R	Time of onset of oestrus (h)						Onset of Oestrus (h)
			24		28		32		
			N	%	N	%	N	%	
Sep.1999	22	6	1	16.7[b]	3	50.3	2	33.3	28.7±1.22[a]
Late Aug. 2000	10	7	1	14.3[b]	4	57.1	2	28.6	28.6±1.04[a]
Early Aug.2001	10	2	1	50.0[a]	1	50.0	0	0	26.0±2.00[b]

a and b: Means bearing different small letters within each column differ significantly (P<0.05). N= number of does R= Responded does

No oestrus response was found in May 2000 and 2001, June 2002 and July 2002.

Duration of oestrus (h):

As shown in table 3, duration of oestrus was longer (P<0.05) in September (28.7 h) and in late August (29.7 h) than in early August (34.0 h). Most does were generally distributed over 28 h in September and late August.

It is well known that variability in duration of oestrus in goats is a matter of breed, season and treatment. The use of hormonal treatment to control oestrous activity in goats affected the duration of oestrus in controlled goats (Table 3) as reported by Chemineau *et al.* (1982) and Mori and Kano (1984) on does synchronized with $PGF_{2\alpha}$.

Table (3): Average oestrous duration (h) and its distribution (%) in treated does in different experiments.

Experiment	N	R	Oestrus duration (h)				Oestrus incidence (h)
			28		32		
			N	%	N	%	
Sep.1999	22	6	5	83.3	1	16.7	28.7±4.99[b]
Late Aug. 2000	10	7	6	85.7	1	14.3	29.7±1.71[b]
Early Aug.2001	10	2	0	0	2	100	34.0±2.00[a]

a and b: Means bearing different small letters within the same column differ significantly (P<0.05). N= number of does R= Responded does

No oestrus response was found in May 2000 and 2001, June 2002 and July 2002

Fertility and kidding rate:

Data in table 4 show that does treated during the breeding season (September) had the highest fertility rate (90.9%). Values of fertility rate in late and early August were 60 and 40%, respectively. In the experiments conducted deeply out of the breeding season (May, June and July), there was no response to treatment. It is of interest to note during the breeding season that fertility rate was higher (P<0.05) in treated than control does (90.9% vs. 47.6). However, no response occurred in control does in early and late August.

It is worthy noting that results of fertility and kidding rates for does of control groups in all experiments are based on natural mating that took place within a joining period contemporary to insemination in treated does.

Table (4): Fertility and kidding rate in response to hormone treatment of does in different experiments.

Experimental	Group	Total	Does kidded		No. kids born	Litter size (X±SE)
			N	%		
Sep.1999*	T	22	20	90.9[a]	26	1.30±0.10
	C	21	10	47.6[b]	15	1.50±0.15
Late Aug. 2000	T	10	6	60.0	9	1.50±0.22
	C	10	0	-	-	
Early Aug.2001	T	10	4	40.0	6	1.50±0.20
	C	10	0	-	-	-

a and b: Means bearing different small letters within the same column differ significantly (P<0.05). * Does in this experiment were inseminated with fresh semen.
May 2000 season was excluded due to poor quality of semen available then.
No oestrus response was observed in May 2000& 2001, June and July

There was a pronounced difference in litter size between treatment and control does in September (1.5 vs. 1.3) although the difference was not differ significantly (Table 4).

Results in table 5 indicate that fertility rate during breeding season was almost higher in does aging <2-4 y than those of >4->6 y in both treated and control does. Both treated and control does, who didn't previously kid during the year of experiment had almost higher fertility rates than those within 3-7 months post partum in the breeding season (September). However, opposite trend was observed in early and only late August for treated does (Table 5).

Table (5): Fertility rates at various age and post partum categories of control and treated does in different experiments.

Experiment	Group	Age categories (year)						Post partum category (month)					
		<2-4			>2->6			NR			3-7		
		N	K	%	N	K	%	N	K	%	N	K	%
Sep. 1999	T	16	15	93.1[a]	6	5	83.3[a]	11	11	100[a]	11	9	81.1[a]
	C	14	7	50.0[b]	7	3	42.9[b]	13	7	53.8[b]	8	3	37.5[b]
Late Aug. 2000	T	8	5	62.5	2	1	50.0	3	1	33.3	7	5	71.4
	C	2	0	0	8	0	0	6	0	0	4	0	0
Early Aug. 2001	T	3	0	0	7	4	57.1	7	2	28.5	3	2	66.7
	C	5	0	0	5	0	0	8	0	0	2	0	0
Overall mean	T	45	20	44.4[A]	27	10	37.0[A]	47	14	29.8[A]	25	16	64.0[A]
	C	34	7	25.8[B]	34	3	8.5[B]	44	7	15.9[B]	24	3	12.5[B]

a and b: Means bearing different small letters within the same column differ significantly (P<0.05).
May 2000 season was excluded due to poor quality of semen available then.

Effectiveness of pre-determined time based insemination:

It is of interest to note that the fertility of does that were inseminated without showing oestrus in response to hormonal treatment was higher than in those that showed oestrus in September season (93.7% vs. 83.3%) but an opposite trend was observed in late August and early August seasons (Table 6).

Comparing rates of fertility (with application of pre-determined time based insemination) with those that would have resulted if insemination was

based on the overt signs of oestrus in September (27.6 vs. 90.9%), early August (10 vs. 40), and in late August (50 vs. 60%) indicate the advantage of applying pre-determined time based insemination when this GnRH hormonal protocol is used.

Table (6): Effectiveness of pre-determined time based insemination in treated does in different experiments.

Experiment	Total	Does showed oestrus			Does did not show oestrus			Total does kidded	
		N	Does kidded		N	Does kidded			
			N	K1		N	%	N	%
Sep.1999	22	6	5	83.3	16	15	93.7	20	90.9[a]
Late Aug. 2000	10	7	5	71.4	3	1	33.3	6	60.0[b]
Early Aug.2001	10	2	1	50.0	8	3	37.5	4	40.0[b]

Season means bearing different capital letters differ significantly (P<0.05).
May 2000 season was excluded due to poor quality of semen available then.
No response was found In May 2001, June and July.
N= Number of does K= kidded does

These results support the practicability and feasibility of the procedure of pre-determined time as a base for implementation of insemination rather than dependence on the occurrence of oestrus, especially during the period of breeding season.

It is important to note that, in almost all studies, hormonal methods are evaluated on: (1) their efficiency to synchronize oestrus and ovulation. (2) fertility if goats are inseminated. The ultimate aim of any oestrous 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 in which case it is the quality of oocyte that was depressed. The variability between animals in timing of oestrus after administration of a synchronization treatment seems to explain the low rate of fertility in goats inseminated at a predetermined time after sponge withdrawal (Freitas *et al.*, 1997).

GnRH- $PGF_{2\alpha}$ -GnRH protocol is based on the assumption that synchronization of follicular waves with GnRH induces the emergence of a new follicle which becomes the ovulatory follicle after prostaglandin treatment. Subsequently, it has been suggested that the use of a GnRH-$PGF_{2\alpha}$-GnRH protocol could eliminate the need for heat detection (Zeroual *et al.*, 1995) but that the timing of the second GnRH injection and AI needed to take account of factors such as season of the year (spring/autumn) and the physiological status of the animals (multiparous/nulliparous).

Pursley *et al.* (1994) reported on post partum cows bred according to this protocol and compared them with lactating animals that received conventional treatment (oestrus detection, a.m. – p.m. breeding and periodic use of prostaglandin); they presented data showing that the protocol permitted effective management of AI without the need for heat detection.

Effect of type of semen (fresh vs. frozen):

Comparison has been made on the base of fertility rate between the use of fresh semen in September (90.9%) on one hand and frozen semen in the other experiments (20%) on the other hand. A significant difference was obtained between the two types of semen for insemination following treatment. Such differences were confound with the effects of season, age and post partum treatment time.. Karatzas *et al.* (1997) reported 65.5 and 53.4% fertility rates following insemination with fresh and frozen semen, respectively. Also, corresponding values of 40.9 and 27.0% (13% difference compared with 40-70% in present study) were reported by Ritar and Salamon (1983). It is proposed, for accurate comparison between the two types of semen in their effect on fertility in Damascus goats, comparison should be made between groups within the same season.

Remainder effect of hormone treatment:

In experiments implemented out of the breeding season, there was no continuation in ovarian activity beyond the end of treatment. Following treatment the potentiality to conceive at oestrus return was only at one cycle later in September and late August while those failed to conceive of does inseminated in early August did not return to oestrus before elapsing time out of >1 cycle later, which is likely then to coincide of the new breeding season.

Table (7): Subsequent fertility rates in does of treated and control group in different experiments.

Experimental	Group	Total	Conceived does							
			Following treatment		One cycle later		>1 cycle later		Overall mean	
			N	%	N	%	N	%	N	%
Sep.1999	T	22	20	90.9^{a}	1	4.54^{0}	0	0	21	95.4^{a}
	C	21	10	47.6^{b}	4	19.0^{a}	2	9.5	16	76.2^{b}
Late Aug. 2000	T	10	6	60.0	2	20.0	0	0	8	80.0^{a}
	C	10	0	0	4	40.0	3	30.0	7	70.0^{b}
Early Aug.2001	T	10	4	40.0	0	0	5	50.0^{b}	9	90.0
	C	10	0	-	0	0	9	90.0^{a}	9	90.0
Overall mean	T	72	30	41.7^{a}	3	4.16^{b}	5	6.94^{b}	38	82.8^{a}
	C	68	10	14.7^{b}	12	17.6^{a}	10	14.7^{a}	32	47.1^{b}

a and b: Means bearing different small letters within the same column differ significantly (P<0.05).

May 2000 season was excluded due to poor quality of semen available then.

No response was found in May 2001, June and July.

Fertility rates of treated does increased from 90.9, 60 and 40% to 95.4, 80.0 and 90.0%. The corresponding Increases in fertility of the controls were from 47.6, 0 and 0 to 76.2, 70 and 90%, with the returned conceivable oestrus being distributed over the two categories (1 cycle and >1 cycle later) in September and late August experiments (Table 7).

During the breeding season, in Damascus goats in Cyprus, Mavrogenis (1988) reported that conception rate at the first oestrus was 79% and at first and subsequent returns to service was 65%. In El-Arish, as a semi-arid area of Egypt, Shalaby *et al.* (2000) found that the conception rate to the first service was 64.2% and the fertility rate was 70%. In the Nile Delta

of Egypt, Teleb (2002) reported 66.7% of Damascus does conceived at the 1st oestrus and 23.8% and 9.5% conceived at 1st and 2nd returned oestrus, respectively. The overall fertility during the breeding season was 90.5% and the kidding percentage was 81.1%.

Continuation of ovarian activity post treatment in the experiments of September and late August may be a matter of natural breeding season rather than remainder effect for hormone treatment. Moreover, in the experiment of early August, resumption of ovarian activity in treated does may have been delayed, waiting for the natural breeding season.

Kidding synchrony and enhancement:

Rate of fertility resulted from treatment in late August (60%) is considered reasonable compared with low fertility (40%) resulted from treatment in early August while higher values (90.9%) resulted in the breeding season (September). Such consideration could be supported looking to 0% fertility in control groups in both late and early August experiments. Hence treatment with GnRH during late August may be recommended to enhance the breeding season in Damascus goats (Table 8).

Table (8): Degree of synchronization and enhancement of kidding in treated does compared with controls in different experiments.

Exp.	Group	Experimental conditions				Flock managerial conditions			
		N	Kidding period		Day	N	Kidding period		day
			Date				Date		
			From-to	X±SE			From-to	X±SE	
Sep. 1999	T	20	15/2-22/2	19/2±0.4	7	-	-	-	-
	C	10	15/2-6/3	24/2±2.9	19	16	15/2-3/4	6/3±4.3	48
L. August	T	6	21/1-1/2	27/1±1.4	11	-	-	-	-
	C	0	-	-	-	7	27/1-25/3	25/2±9.7	58
E. August	T	4	5/1-9/1	7/1±0.95	4	-	-	-	-
	C	0	-	-	-	9	18/2-3/4	6/3±5.51	45

For the purpose of assessing the degree of synchronization, the period within which kidding occurred (days) was calculated for does kidded in different experimental groups in the three mentioned experiments (Table 8). Correspondingly, duration of kidding period has also been calculated for does of control groups kidded out of those allowed for mating from the end of the experimental time up to season close (January) under the flock managerial conditions.

Under experimental conditions, only experiment in which comparison of kidding synchrony between treatments and control can be done is that of September. It is clearly shown in table 8 kidding that occurred within a periods of 37% of that in the C group (7 and 19 days, respectively), where fertility rates were 90.9 and 47.6% in the two groups, respectively (Table 8).

As mentioned above, fertility rates results in late August seem reasonable compared with those of early August and it is interesting to find out how date of kidding is set forward to that under flock managerial conditions. Mean kidding date was 27/1 for treated does compared with 25/2

for those under flock managerial conditions. This difference (almost one month) seems convincing and leads to recommend the use of hormone treatment (GnRH) in late August for the enhancement of the breeding season. Treatment in early August although resulted in relatively low fertility (40%), it led to 2 months earliness of season and could be recommended as case dependent.

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النشـــاط الشـــبقى للمـــاعز الدمشـــقي المعاملـــة هرمونيـــا بجونـــادوتروفين – بروستاجلاندين-جونادوتروفين خلال العام

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أجريت هذه الدراسة في محطة بحوث الإنتاج الحيواني بسخا على ٧٠ عنزة دمشقي عمر ١,٥-٨ سنوات بهدف دراسة استحداث النشاط الشبقى خلال موسم عدم التناسل وتوحيد الشبق خلال موسم التناسل لتحسين الخصوبة وزيادة عدد المواليد. استخدم برنامج هرموني جديد وهو المعاملة بالجونادوتروفين خلال الأوقات المختلفة من العام. وقد أجريت ٧ تجارب خلال أوقات مختلفة من العام في الفترة من سبتمبر ١٩٩٩ حتى أغسطس ٢٠٠٢. قسمت الماعز خلال كل تجربة إلى مجموعتين متماثلتين حسب العمر ووزن الجسم والحالة الفسيولوجية. في التجربة الأولى عوملت الماعز بالحقن بالعضل عند بداية المعاملة بـ ١ مل جونادوتروفين متبوعة بعد ٧ أيام بالحقن بالعضل بـ ٠,٧ مل بروستاجلاندين ثم بالحقنة الثانية من الجونادوتروفين (١ مل) في اليوم التاسع ثم لقحت كل الماعز المعاملة صناعيا بعد ٢٤ ساعة من أخر حقنة. ماعز المجموعة الثانية لقحت طبيعيا بعد كشف الشياع بترك تيس مخصب في ذات الفترة المقابلة لبداية المعاملة الهرمونية حتى نهاية موسم التلقيح (نهاية شهر يناير لكل من التجربة ١، ٣، ٥)، ولمدة تغطى دورتين شبق (التجربة ٢، ٤، ٦، ٧).

أوضحت النتائج أن معدل النشاط الشبقى عقب المعاملة تراوح بين صفر% أثناء فترة عدم التناسل حتى ٧٠% خلال موسم التلقيح وكذلك تناقص تدريجي في ظهور الشبق بالتقدم في العمر. بدء ظهور الشبق للماعز المعاملة بعد ٢٨ ساعة فاكثر في أخر معاملة. كانت نسب الخصوبة عالية في موسم سبتمبر (٩٠,٩%) بينما كانت ٤٠% في أول أغسطس و ٦٠% في نهاية أغسطس للماعز المعاملة . في موسم عدم التناسل لم يكن هناك اى استجابة للمعاملة الهرمونية. أما الماعز المقارنة فلقحت فقط في سبتمبر (موسم التناسل) وكانت نسبة الخصوبة ٤٧,٦% وبفروق معنوية عند مستوى ٥% عن تلك التي تم معاملتها. أدت المعاملة خلال موسم التناسل (سبتمبر) إلى زيادة نسبة الخصوبة والى تقليل فترة الولادة بنحو ٣٧% عن المجموعة المقارنة (٧ أيام مقابل ١٩ يوم). المعاملة خلال فترة الانتقال من فترة عدم التناسل إلى موسم التناسل (أول ونهاية أغسطس) بكرت موسم الولادة بحوالى ١-٢ شهر.

توصى هذه الدراسة من خلال النتائج المتحصل عليها باستخدام برنامج المعاملة بالجونادوتروفين خلال موسم التناسل بهدف توحيد التبويض والولادة من خلال التلقيح المعتمد على وقت محدد بغض النظر عن حدوث شبق. المعاملة بالجونادوتروفين استغرقت ١٠ ايام فقط وكانت نتائج الخصوبة ٩٠,٩%. يمكن استخدام المعاملة الهرمونية خلال الفترة الانتقالية (أغسطس) بهدف التبكير بالولادة والتي تعتمد في النهاية على الناحية الاقتصادية ايهما أجدى اقتصاديا الحصول على مولود أم إنتاج اللبن. إذا كانت المعاملة الهرمونية خارج الموسم ضرورية فلا يوصى باستخدام المعاملة الهرمونية بالبرنامج المستخدم ويكون دائما التلقيح الصناعي يعتمد على كشف الشياع أو وقت محدد للتلقيح بغض النظر عن حدوث الشبق.