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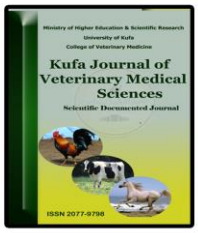

Effect of long and short-term progestagen treatments combined with PMSG and $PGF_2\alpha$ on estrus synchronization in Iraqi goats during breeding season

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Abstract

The objective of this study was to evaluate long and short-term protocols of estrus synchronization and their impact on the fertility in Iraqi goats. This study was conducted in the college of veterinary medicine at Diyala University for the duration extends from May - 2014 until November - 2014. The study included sixteen multiparous goats, these goats were allocated into two groups: Group I (short- term protoco),Group II (long-term protocol) treated with intravaginal sponges contain(20mg) cronolone (fluorogestone acetate) for 9 days for the Group I, and 12 days for the Group II and injection (250µg) cloprostenol for both groups in day of insertion. The goats of two groups were injected (750 IU) PMSG before 24 hours of removal the vaginal sponges and placed with one mature buck. Estrus detection was done by visual inspection. Pregnancy diagnosis was performed trans-abdominally using a real-time ultrasound examination with a 3.5MHz sector transducer, whereas, the scan was performed at 40-50day after estrus (estrus day=day 0).No significant difference was observed in the interval between the ends of the estrus synchronization protocol and standing heat amongst the goats of two groups. Whereas all goats show estrus signs after 36-48 hours from withdrawal of intravaginal sponges. The number of pregnant goats in two groups was (10/16; 62.5 %) while the number of non-pregnant goats in both groups was (6/16; 37.5%) with significant difference between these two groups at ($P<0.01$). The number of pregnant goats in the short-term protocol and long-term protocol was (4/8; 50%) and (6/8; 75%), respectively, with significant difference between two groups at ($P<0.01$). Litter size was 300% and166.7% in the short term protocol and long term protocol, respectively, with significant difference between two rates at ($P<0.01$).

Conclusion: It was concluded that both two treatments protocols by using progestagen intravaginal sponges combined with PMSG and $PGF_2\alpha$ were effective in

estrus synchronization, and had positive effect on the fertility in Iraqi goats during breeding season.

Keywords: estrus synchronization**,** PMSG, progestagen, $PGF_2\alpha$, goats.

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دراسة تأثير علاجات البروجستاجين الطويلة والقصيرة الأمد مع هرمون مصل الفرس الحامل والبروستاكلاندين أف$_2$ الفا في توحيد الشبق في الماعز العراقي خلال موسم التناسل

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الخلاصة

تهدف الدراسة إلى تقييم برامج توحيد الشبق الطويلة والقصيرة الأمد باستعمال البروجستاجين وهرمون مصل الفرس الحامل والبروستاكلاندين اف$_2$ الفا وتأثيرها على الخصوبة في الماعز العراقي خلال موسم التناسل. أجريت هذه الدراسة في كلية الطب البيطري - جامعة ديالى للفترة الممتدة من مايس- 2014 لغاية تشرين الثاني- 2014. اشتملت الدراسة ست عشرة من إناث الماعز المتعددة الولادات، قسمت الإناث إلى مجموعتين متساوية العدد، المجموعة الأولى وضعت في برنامج توحيد شبق قصير الأمد. والمجموعة الثانية وضعت في برنامج توحيد شبق طويل الأمد. عولجت كلتا المجموعتين بإدخال أسفنجات مهبلية تحتوي على 20 ملغم من كرونولون (فلوروجستون اسيتيت) لمدة تسعة أيام للمجموعة الأولى وأثنى عشر يوما للمجموعة الثانية. حقنت حيوانات المجموعتين (250مايكروغرام) من كلوبروستينول في نفس يوم إدخال الأسفنجات المهبلية . حقنت المجموعتان (750) وحدة دولية من فوليكون قبل أربع وعشرين ساعة من إزالة الأسفنجات المهبلية ،ثم أطلقت حيوانات المجموعتين مع تيس ناضج جنسيا وتم مراقبة الشبق في تلك الحيوانات عينيا. استخدمت تقنية الفحص بالموجات فوت الصوتية لتأكيد حصول الحمل خلال الفترة 40-50 يوم بعد الشبق ,اعتبر يوم الشبق هو يوم الصفر.وأجري الفحص باستخدام مجس منحني ذو تردد 3.5 ميغاهرتز عبر جدار البطن. لم يسجل فرق إحصائي معنوي بين كلتا المجموعتين من حيث الفترة الممتدة من انتهاء برنامج توحيد الشبق إلى حين ظهور علامات الشبق في حيوانات المجموعتين، في حين أظهرت كل الحيوانات علامات الشبق بعد 24-36 ساعة من إزالة الأسفنجات المهبلية. بلغ عدد الماعز الحوامل في كلتا المجموعتين(16/10; 62.5%) في حين كان عدد الحيوانات غير الحوامل في كلتا المجموعتين(16/6 ; 37.5%) مع وجود فرق إحصائي مهم بين المجموعتين عند (P<0.01). كان عدد الماعز الحوامل في البرنامج قصير المدى والبرنامج طويل المدى(8/4; 50 %) و (6/ 8; 75%) على التوالي. مع وجود فرق إحصائي مهم بين المجموعتين عند (P<0.01). كانت النسبة المئوية لعدد الولادات للبرنامج قصير المدى والبرنامج طويل المدى 300% و 166.7% على التوالي مع وجود فرق إحصائي مهم بين النسبتين عند (P<0.01).

الاستنتاجات: يمكن أن نستنتج من هذه الدراسة أن كلا البرنامجين الطويل والقصير الأمد باستعمال الاسفنجات المهبلية الحاوية على البروجستاجين مع هرمون مصل الفرس الحامل والبروستاكلاندين ف$_2$ الفا كانا فعالين في توحيد الشبق ولهما تأثير ايجابي على الخصوبة في الماعز العراقي خلال موسم التناسل.

الكلمات المفتاحية : توحيد الشبق، هرمون مصل الفرس الحامل، بروستاكلاندين اف$_2$الفا، ماعز

Introduction

Goats play an important role in income generation to farmers. Several methods have been developed to induce estrus in goats allowing farmers to raise and provide kids to meet market demands for meat and milk (**1**). Estrus synchronization enables kidding over a limited period thereby allowing

producers to give optimum care for the mothers and kids and in turn reduce kid mortality (**2**). Importantly, producers are able to breed their goats so they can kid at the time of the year when pasture is more abundant. Intravaginal devices containing natural and synthetic types of progestagens, maintained in situ during 14–21 days, associated with gonadotrophin administration is the most widely used **(3**).

The use of intravaginal progestagens followed by pregnant mare's serum gonadotropin (PMSG) injection to synchronize estrus during the normal breeding season (**4**), to induce estrus out of season (**5**), and to improve ovulation rate (**6, 7,8**) has been reported. The most widely used procedures for synchronization and/or the induction of estrous are 12–21 days of FGA or MAP impregnated intra vaginal sponge treatment (**9, 10, 11**) and an intramuscular injection of PMSG at progestagen withdrawal (**12, 13**), or 11 days treatment with FGA impregnated intravaginal sponges and an intramuscular injection of PMSG and a synthetic PGF2α analogue 48 h before or at sponge withdrawal (**14, 15**). During the breeding season, when goatsare actively cycling, estrus can be synchronized with PGF2α or one of its analogues such as cloprostenol (**16**). The most widely used method uses progesterone or progestagenfor 9–11 d followed by a luteolytic dose of prostaglandin (PG), or an analog, administered 48 hr prior to the end of the treatment (**17,18,19**).

Long-term progestagen treatments effectively synchronized estrus, but with variable fertility (**20**), however, long term progestagen treatments have been associated with low fertility (**21**).

For the last 15 years an alternative methods for Estrus synchronization of small ruminants, named short-term progestagen treatment (consisting of 5-7 days progestogen priming) were developed (**20**).

Studies of (**22,23**) have focused on the duration of the progestagen-based synchrony treatments, Intravaginal devices containing different types of progestagens, maintained during 6-14 days associated with or without PMSG or PMSG and PGF2α combinations have been used. Intramuscular administration of 400 IU and 500-700 IU of PMSG at day when intravaginally applied sponges were removed increased the ratio of ovulation and twinning rate (**24**). Other studies established that administration of PMSG at estrus can decrease variable time of LH surge and ovulation rate and it improves reproductive performance in small ruminants (**25**).

Materials and methods

This study was conducted at the college of veterinary medicine in Diyala province for the duration extends from May-2014 until November-2014. The animals of the present study were sixteen multiparous goats at 2-5 years old. The goats were divided into two groups, Group I (8 goats) is put under short- term protocol of estrus synchronization while Group II(8 goats) is put under long- term protocol of estrus synchronization.

In the first day of synchronization the intravaginal sponges (CHRONOGEST, 20 mg cronolone, Intervet International B.V. Boxmeer, Netherlands) are inserted, and all the goats of both groups were intramuscular injected with (250 µg) Estrumate (Cloprostenol sodium,Essex Animal Health Friesoythe, Germany)

in day of insertion. The vaginal sponges were withdrawn at 9th day after sponges insertion from the goats of Group I, and at 12th day after sponges insertion from the goats of Group II. All does of both groups injected intramuscularly with 750 IU of PMSG(FOLLIGON, Intervet International B.V. Boxmeer, Netherlands) 24 hrs., before removal of the intravaginal devices. After withdrawal of vaginal sponges, all these goats were placed with one mature buck and were observed visually for the behavioral estrus manifestation twice daily for five days after sponges' removal. Standing to be mounted was used to determine estrus response. Estrus signs appeared in all goats after 36-48 hrs from sponge withdrawal. The statistical analyses were carried out to know the significant statistical differences between two groups by using**(χ^2)** (**26**).

Pregnancy diagnosis through ultrasonic diagnosis: The day of estrus was consider as day 0 for calculating the gestational age .using a real-time ultrasound scanner equipped with a 3.5-5 MHz sector array transducer(Welld ultrasound ,Shenzhen well.D.Medical Electronics Co.LTD.China). Light wave record and play video, USB 2.0 TV BOX. All does were scanned by trans-abdominal ultrasonography examination according to (**27**), at days 40-50 of gestation.

Recognition of the fetus (es) or placentomes was used as the criterion for a positive pregnancy diagnosis .During the first trimester, the embryo appears as an echogenic mass surrounded by anechoic fluid within the uterine lumen (figure**1,2and 3**).Placentomes are more easily seen as C-shaped densities with the concave surface directed toward the uterine lumen **(28**).

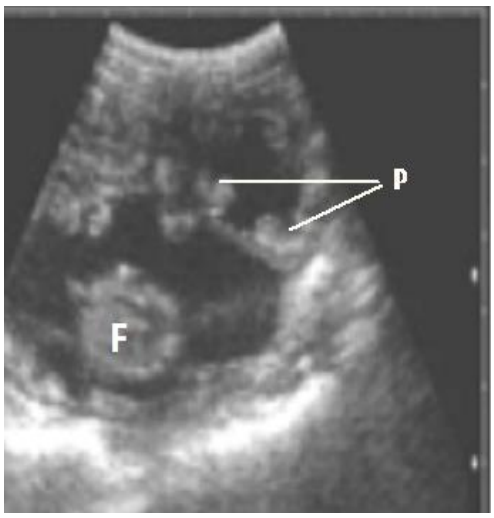

Fig.1: Ultrasound image of a 50-day,Single pregnancy. (3.5 MHz sectorial probe; depth 18 cm) F: Fetus; P: placentome.

Fig.2: Ultrasound Image of 47-day, Twins pregnancy (3.5MHz sectorial probe; depth 11cm).F:fetuses.

Fig.3: Ultrasound image of a 50-day, Triple pregnancy (3.5MHz; depth 10cm) .F: fetuses.

Results and discussion

Table (1) shows the percentage of non pregnant female goats was (37.5%) while the percentage of pregnant female goats was (62.5%) with significant difference between two groups at ($P< 0.01$). these results are in agreement with many studies revealed that estrous synchronization by using progestagen intravaginal sponges , PMSG and $PGF_2\alpha$is very effective, giving acceptable conception rates**(29,30**). Hormonal treatment to control ovulation and reproduction is a prerequisite for successful breeding and increasing the number of pregnant females (**31**)resulting in short breeding period and more uniform newborn crop (**32**).

It has been stated that a single injection of PMSG after intravaginal sponges removal increases efficiency of fertility rate and may shorten the breeding period, which in turn may result in increased profit through better animal productivity(**33)**.

Pregnant mare's serum gonadotropin (PMSG) may play a role in increasing the number of growing follicles, ovulation rate and eventually litter size(**34**), (**35**) indicated The PMSG has been shown to reduce the interval from sponge withdrawal to estrus and improve the efficiency of synchronization of oestrus and ovulation during the breeding season in sheep.(**36**).

The table also shows there is increase in the percentage of litter size which was 137.5% in the treated animals, this result is consistent with many studies that indicate the highly kidding rate in synchronized females (**37, 25**), and this may due to the influence of PMSG and $PGF_2\alpha$ treatment.

$PGF_2\alpha$ effectiveness in inducing luteolysis in goats during breeding season was reported (**37**)and conception rate was high with no adverse effective fertility (**38**). PMSG treatment, is needed to stimulate the follicular growth leading to higher

ovulation rate (**39**)Litter size is increased in treated groups due to increased rate of ovulation and this causes an increase in it (**40**).

Table (1): percentages of pregnant, non-pregnant and litter size of studied goats

Total animal number	**Non pregnant goats %**	**Pregnant goats** %			**Litter size**
		10/16 (62.5)			**137.5%**
16	**6/16(37.5)**	Single bearing	Twin bearing	Triple bearing	**10.445****
		2/10	**4/10**	**4/10**	

Comparison between pregnant and non pregnant goats at (P<0.01).

Table (2) shows a significant difference in the percentages of pregnant females between the short term protocol and long term protocol of synchronization, which were 50.00 and 75.00 % respectively.

The results of this table are comparable to**(8)** but are disagreement with**(36,41)** who obtained a higher pregnancy rate after short treatment compared to the long treatment of synchronization. This variation or difference between our study and previous study may be due to effect of age and parity, breed, nutrition, treatment protocol, location, management and climate **(10,42)**. It is well known that the short term protocol of synchronization is more useful for the flexibility of the usage under field conditions**(43)** and it is highly effective to induce estrus and subsequent fertility **(44,36)**. It was reported that the long progesterone treatment results in subluteal progesterone level **(20)**. This phenomenon leads to increasing the LH pulses frequency, but the LH surge does not occur, and result in persisting largest follicle **(41)**. However, long term progestagen treatments have been associated to low fertility **(21)**.

This real variation in percentages of pregnant and non pregnant goats in our study may also attributed to the little number of studied females in this experiment and perhaps the large number of females or goats in the previous studied may yield this variation between them and our results.

In the present study we have used greater doses of PMSG in both protocols of synchronization and this may lead to increase in the percentage of pregnant animals in long term protocol. **(45)** have pointed out that greater doses of PMSG could have promoted greater ovarian activity, which could have decreased the interval to onset of estrus and ovulation, and there is a linear relationship between dose of eCG and ovulation number**(46)**.

Table (2) also shows that the rate of litter size was 300.00 and 166.7 % for the short term and long term protocol respectively, and there is

significant difference between two protocols at (P<0.01).

The highly rate of litter size associated to the short term protocol in our study attributed to the triple pregnancy accompanied the short term protocol of synchronization.

The result of this table is consistent to many studies have revealed the increasing of kidding rate associated to estrus synchronization using progestagens vaginal sponges with PMSG and PGF_2 alpha **(22,23)**.

The efficiency of PGF2α-FGA-PMSG-short term protocol could be explained by the fact that PGF2α injection at the time of the Intravaginal sponges insertion promotes the growth of a large follicle, which is aged about 5 days at end of treatment and intended to ovulate in most does with subsequent fertile breeding **(21)**.

It was pointed out that administration of PMSG especially in high dose increased the number of follicles and therefore raised the twinning and triplet rates **(47)**. And cloprostenol seems to be very effective for rapid lysis of the caprine corpora lutea and subsequent falling of progesterone levels during breeding season when does are cycling **(48)**. prostaglandin, as a synchronizing agent, is effective only during the active breeding season by causing luteolysis of the corpus luteum. **(49)**.

Table (2): comparison between the short and long protocol of estrus synchronization in studied goats

Type of protocol	No. of animals	Non pregnant animals %	Pregnant animals %	Type of pregnancy			Litter size
				single	twin	triple	
Short protocol	8	4/8 (50)	4/8(50)	_	_	4	300
Long protocol	8	2/8(25)	6/8 (75)	2	4	_	166.7
χ^2	------	8.255**	8.255**	----	----	----	33.91**
P<0.01							

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