IMPACT OF DIFFERENT ESTRUS SYNCHRONIATION METHODS ON REPRODUCTIVE PARAMETERS OF KARADI AND ARABI EWES IN ERBIL REGION

E. A. H. Al-Marzani* **M. S. Barwary**
Lecturer **Assit. Prof.**
Coll. Agric. Engine. Sciences / University Salahaddin **Coll. Agric. Engine. Sciences / University Duho**
edres.hamadamen@su.edu.krd **mwafaq.barwary@uod.ac**

ABSTRACT

This study was carried out to compare the effects of intravaginal FGA sponges to synchronize estrus on reproductive performance of the Karadi and Arabi ewes , 30 for each breed at 2-4 years during the breeding season were used. Ewes from each breed were equally and randomly distributed into three groups. The first group was treated with vaginal sponges saturated with (40 mg) of FGA within a period of 14 days (T1). The second group administrate with the FGA and is injected with a dose of 400 IU of the PMSG hormone (T2). The third group treated with a dose of 0.5 ml/head of PGF2α hormone (T3) on the day of sponge removal, was injected at. The result of the study showed a non-significant increase in the estrous rate, fertility rate and Prolificacy between Different groups regardless type of breed. Different treatments showed a significant difference (p≤ 0.05) in the pregnancy length, the T3 group showed the shortest period and the highest lambing number in comparison with T1 and T2. Birth weight increased significantly (p≤ 0.05) in T1 and T3 (4.413, 4.310) kg respectively with a slight difference between the Karadi and Arabi breeds. In conclusion, exogenous hormonal treatments in a combination of FGA sponge using PMSG and PGF2α improved reproduction parameters.

Keywords: Estrous synchronization; fluorogestone acetate (FGA), Arabi, Karadi.

مجلة العلوم الزراعية العراقية- 2025 :56 (2):727-735 المرزاني وبرواري

تأثير طرق توحيد الشبق المختلفة على صفات التناسلية في نعاج الكرادية والعرابية في منطقة أربيل

ادريس عبدالله حمدامين المرزاني موفق سليمان برواري
مدرس استاذ مساعد
كلية علوم الهندسة الزراعية/ جامعة صلاح الدين كلية علوم الهندسة الزراعية/ جامعة دهوك

المستخلص

أجريت هذه الدراسة على نعاج الكرادية والعرابية 30 لكل سلالة بعمر 2–4 سنوات خلال موسم التكاثر لمقارنة تأثيرات الاسفنجات المهبلية المشبعة بـ فلوروجستون أسيتات (FGA) داخل المهبل لمزامنة الشبق على الأداء التناسلي للنعاج. تم توزيع النعاج من كل سلالة بالتساوي والعشوائية إلى ثلاث مجموعات. المجموعة الأولى عولجت بإسفنجات مهبلية مشبعة بـ (40 ملغ) من فلوروجستون أسيتات (FGA) لفترة (14) يوماً (T1). المجموعة الثانية عوملت بـ FGA ويتم حقنها بجرعة 400 وحدة دولية من هرمون المصل فرس الحاملPMSG (T2). المجموعة الثالثة عولجت بـ الاسفنجات (FGA) وفي نفس يوم سحب الاسفنجة تم حقن بجرعة 0.5 مل / رأس من هرمون البروستاجلاندين.PGF2α (T3). أظهرت نتيجة الدراسة زيادة غير معنوية في النسبة للشبق، الخصوبة والخصب في مجموعات المختلفة بغض النظر عن نوع السلالة. أظهرت االمعاملات المختلفة اختلافًا معنويًا في طول الحمل، حيث أظهرت مجموعة T3 أقصر فترة وعدد ولادات أعلى مقارنة بمجموعتي T1 و. T2 كما أظهرت النتائج لوزن الميلاد فرق معنوي بلغ 4.413 4.220 و 4.310 كجم في T1 و T2 و T3 على التوالي مع اختلاف طفيف بين السلالتين. في الختام، أدت العلاجات الهرمونية الخارجية في مزيج من إسفنجة FGA باستخدام PMSG و PGF2α إلى تحسين معايير التكاثر.

الكلمات المفتاحية: التزامن الشبق . فلوروجستون أسيتات (FGA) ، العرابي، الكرادي.

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INTRODUCTION

The sheep sector in Iraq is a distinguished place in the agricultural economy and has effectively contributed to providing an important part of the nutritional needs of red meat and milk, as well as wool production (5). Reproductive efficiency is one of the main props of sheep raising and production due to its decrease in Iraqi local sheep farms (28). Modern sheep farms have improved and controlled the reproduction process of intensive production. The synchronization of estrus in ewes focuses on the manipulation of the estrus cycle (51). synchronization of estrus through hormones has been available for the last years and has successes as a method to make artificial insemination (AI) more practical (22, 34). As well, it could be used among others, to produce large number and dairy animals in a short period of time to match calving with feed availability and market demand for dairy products (4). The most common techniques are progestogen and prostaglandin, in order to control of the lifespan of corpus luteum, inserted for a period arranged for 12-14 days, followed by an administration of Human chorionic gonadotropin (hCG) (23). Administrations of intravaginal progestagen for 10-16 days, followed by intramuscular injection of eCG, have been successfully used (42). Progestagens appear to be the most practical hormones of choice (44,33), during the breeding and non-breeding season (15). The use of prostaglandin F2α (PGF2α) reduced costs and are less environmental pollutants compared with progestogen intravaginal devices (20). Prostaglandins are rapidly metabolized in the lung and have no tissue remnants. Therefore, the use of PGF2α or its analogues is a good alternative synchronization method in sheep (11). Pregnant mare serum gonadotropin (PMSG) represented a new reproductive approaches such to synchronize estrus to increase prolificacy that leads to gain practical and economic advantages (18,30). In fact, Between all hormonal approaches to increase lambing rate, administration of PMSG is more usual than other techniques. The (43) reported that injection of PMSG at the end of the progestogen's treatment causes more precise synchronization of estrus in small animals. Using of PMSG after exogenous progesterone removal causes estrus signs to begin earlier, become more pronounced and lasts longer (47), besides that, a long estrus period may result in increasing the concentration of circulating estrogen which causes luteinizing hormone (LH) peak (47). This may increase the ovulation rate and enhances twining rate. It has been shown that an adequate dose of PMSG improves proliferation, but the use of high dose induces multiple gestations and thus, an increase in fetal or lamb mortality (10) Furthermore, to avoid non desirable fetal or losses and large litter sizes, the dosage level of such gonadotropin has to be adjusted according to breed, season and the physiological status of the ewes (38). Regarding the low technology and low productivity of sheep sector in Iraq. The aim of the current investigation to know the possibility of using intravaginal progesterone sponges with some hormones (PGF2α, PMSG) to stimulate the reproductive activity of ewes, the extent of the response of the Karadi and Arabi breeds in the Erbil region to hormonal treatments in the events of estrus. Besides the effect of treatment on fertility and prolificacy rate of ewes.

MATERIALS AND METHODS

Animals and Experimental design

The current experiment was conducted in a private field in Trpespyan farm / Erbil city/Iraq, between 1/7/2020 and 15/1/2021. The experiment included sixty Karadi and Arabi ewes (30 for each breed) at 2-4 years of age and body weight from 45-55kg for Karadi and Arabi ewes. Each group was randomly subdivided into three groups, (10 ewes in each group), and experimental animals were subjected to the same administrative and nutritional conditions prevailing in the field, the concentrated fodder (300 - 500 g / head / day) was provided into main two meals, morning and evening, with molds of mineral salts, suspend inside the barn, provided with the provision of free straw permanently, providing water and permitting for animals to graze in the morning and evening, and in addition to that ewes will weekly administrate with the animals vitamin (AD3 and E) to compensate for the lack of vitamins during the

experiment. The first group (T1): - (10) ewes. Treated with vaginal sponges saturated with (40 mg) of Flurogeston acetate (FGA) will inserted for a period of fourteen days. The second group (T2): - (10) ewes administrated with the same first treatment, then injected with dose 400 IU per head of the hormone (PMSG) on the day of sponge removal. The third group: - (10) ewes administrate with the same first treatment and on the day of sponge removal was injected at a dose of 0.5 ml / head of prostaglandin hormon (PGF2α).

Estrus detection and mating:

Two fertile Karadi and Arabi rams were introduced to the ewes in each experimental group (one ram per 5 ewes) for estrus detection and Rams were mating; starting at the sponge withdrawal day allowed to rotate among different ewes groups to avoid sire/group confounding effect. Painted-breast fertile rams were introduced to ewes for five days. Ewes with marked rumps were considered to be mated.

Reproductive efficiency Traits

Estrus rate = number of ewes showing signs of estrus/total ewes treated x100.

Fertility ratio = number of ewes lambed/ number of ewes exposed to ram for inseminated x 100

Prolificacy= number of lambs born/ number of ewe lambed

length of pregnancy = The extended period of fertilization was calculated until birth and factors affecting them : breed ,sex of lamb, type of birth, Birth weight

Birth weight of lambs = the kilograms lambs born/ number of lambs born

factors affecting them : breed, sex of lamb, type of birth and Dam weight at birth

Statistical analysis

General Linear Model (GLM) within the statistical program SAS, 2005(40) used to analyze the collected data to diagnosing the significance effects of the available factors affecting the studied traits, and the experiment was designed as factorial-CRD.

Duncan multiple range tests (17) were used to test the differences between the sub classes of each factor.

RESULTS AND DISCUSSION

Reproductive efficiency: Improving sheep productivity by increasing lambing frequency and fecundity is considered critical in the development of sheep production in Iraq. According to the statistical analyses. above 90% of ewes tested had Estrus. Considering the breed as co-factor (Karadi vs Arabi ewes), Effects of FGA which used to synchronize estrus and different doses of PMSG and PGF2α on fertility parameters and Prolificacy were presented in Table 1. Rate of estrus in Karadi and Arabi breed were 86.67 and 93.33 respectively without significant differences. The rates of estrus in groups T1, T2, and T3 were found as 85, 90, and 95%, respectively. There was no significant difference among groups (P>0.05). This result agreed with what was found by Juma (19) in the Hamdani ewes. The interaction between the breeds and treatments didn't significantly affect the rates of estrus ,despite the superiority of the Arabi with T3 over the rest. Fertility rate also improved non-significantly with higher rates 90 in T3. Prolificacy rates did not show any significan differences. This is in agreement with Neves et al (36) reported that several hormonal treatments have been used to synchronize estrus in small ruminants, in both long-term and Short-term protocols during both the breeding and non-breeding seasons. The improvement in the estrous response or percentage 95 and fertility rates 90 especially in the T3 regardless of the breed type may be related to the fact that PGF2α and Progestogens or their analogues were used to increase fertility and estrus percentage in the ewes. In facts, the continuous exposure of the uterus to progesterone for 8–10 days during the estrous cycle causes downregulation of the progesterone receptor (PR) in the endometrium, allowing estradiol to bind to the estrogen receptor (ESR1), and resulting in the synthesis and insertion of the oxytocin receptor (OXTR) in the endometrium (41). Oxytocin (OXT) binds to its endometrial receptor, activating the synthesis and pulsatile release of PGF2α into the uterine ovarian vein (6). ProstaglandinF2α crosses over into the ovarian artery from the ovarian vein this unique mechanism allows PGF2α to be delivered directly to the CL without the entrance of the systemic circulation. The local effects of PGF2α result in the demise of the CL, leading to a new estrous cycle in the non-

pregnant mothers (12). Sheep synchronized with a protocol based on prostaglandins improves estrus onset, prolificacy, and fecundity in wool breeds(14). Assumed that PMSG Injection following the treatment of ewes in the breeding season with vaginal sponges containing FGA resulted high percentage in both estrus and conception levels(25). The same results were concluded by (16, 29) There was a significant difference in the pregnancy length in the current study with the shortest period in the group treated with PGF2α (T3). It has been suggested that prostaglandin metabolites cause the release of oxytocin from the corpus luteum and lead to continuation of luteolytic activity and the end of pregnancy (45). Shortened gestation periods may resulted in increased lambing rate and finally increase the productivity in the lamp positivelly. Hence, (50) recorded a pregnancy rate as 75% and a lambing rate as 94.6% in ewes treated with intravaginal sponges and PMSG. When compared to previous study of (31) investigating the fertility of MIS sheep after progestagen + PMSG synchronized oestrus outside breeding season, present study resulted in lower lambing rate, lower litter size, as well as lower stillborn rate. It is concluded that sponges plus PMSG injection increased twinning rates of Awassi ewes. Additionally, PMSG treatment assumed to increase Pregnancy rates and twinning rate as well as affecting pregnancy period and the birth weight (49). In contrast, other report assumed that PMSG administration of 300 IU was not effective to stimulate follicular maturation and differed according to some breeds response (35). In the cyclic ewe, plasma progesterone concentration highly decreased on the day before estrus, also PMSG, increased rate of ovulation hence, increasing multiple births and litter size. Akoz et al., (2) referred that PMSG increased mean progesterone concentration at 30th day of pregnancy with the highest value in the group of ewes treated with the higher dose of PMSG. Equine chorionic gonadotropin (eCG) administration increases the occurrence and speed of follicular development and ovulation, thereby improving the fertility rate following insemination and this effect may be mediated by increasing progesterone level (1). Other study concluded that 14 days of progesterone analogue (norgestomet) treatment produced higher conception rates and a greater number of pregnancies at the beginning of the breeding season (13). Conducted a study by using Yankasa ewes found that injection of pregnant mare serum gonadotrophin increased ovulation rates and peripheral progesterone concentrations in a dose dependent manner (39).

Table 1. Means ± Standard Error (S.E.) for the effect of treatment and breed on reproductive traits of ewes

Effects		No.	Estrus response	Estrus (%) Means ± S.E.	No. of ewes lambing	Fertility (%) Means ± S.E.	No. of lamb born	Prolificacy Means ± S.E.
Over all mean		**60**	**54**	**90.00 ± 3.90**	**49**	**81.67 ± 5.04**	**56**	**1.143 ± 0.05**
Breed	**Karadi**	**30**	**26**	**86.67 ± 6.31a**	**24**	**80.00 ± 7.43a**	**28**	**1.167 ± 0.08 a**
	Arabi	**30**	**28**	**93.33 ± 4.63a**	**25**	**83.33 ± 6.92 a**	**28**	**1.120 ± 0.07 a**
Treatment	**T1**	**20**	**17**	**85.00 ± 8.19a**	**15**	**75.00 ± 9.93a**	**15**	**1.000 ± 0.00 a**
	T2	**20**	**18**	**90.00 ± 6.88a**	**16**	**80.00 ± 9.17a**	**20**	**1.250 ± 0.11 a**
	T3	**20**	**19**	**95.00 ± 5.00a**	**18**	**90.00 ± 6.88a**	**21**	**1.167 ± 0.09 a**
Interaction	**T1 Karadi**	**10**	**8**	**80.00 ± 13.33a**	**7**	**70.00 ± 15.27a**	**7**	**1.000 ± 0.00 a**
	T2 Karadi	**10**	**9**	**90.00 ± 10.00a**	**8**	**80.00 ± 13.33a**	**10**	**1.250 ± 0.16 a**
	T3 Karadi	**10**	**9**	**90.00 ± 10.00a**	**9**	**90.00 ± 10.00a**	**11**	**1.222 ± 0.15 a**
	T1 Arabi	**10**	**9**	**90.00 ± 10.00a**	**8**	**80.00 ± 13.33a**	**8**	**1.000 ± 0.00 a**
	T2 Arabi	**10**	**9**	**90.00 ± 10.00a**	**8**	**80.00 ± 13.33a**	**10**	**1.250 ± 0.16 a**
	T3 Arabi	**10**	**10**	**100.0 ± 00.00a**	**9**	**90.00 ± 10.00a**	**10**	**1.111 ± 0.11 a**

Means within factor followed by similar letters in the columns are significantly not different (p≤ 0.05)

Length of pregnancy

Rate of Pregnancy Length in Karadi and Arabi breed were 149.58 and 149.44 respectively without significant differences are shown in Table 2. revealed that regardless the breed type, the pregnancy Length showed significant differences between groups. Group T3 showed a significant reduction (p≤0.05) in the pregnancy Length (149.11) in comparison with T1 group with pregnancy period of (149.93)

days. The effectiveness of PGF2α in accelerating the delivery of the sheep may be related to the local lysis effect of prostaglandinF2α on the corpus luteum (CL) (24). Prostaglandins may also activate the oxytocin receptors (OXTR) in the uterus. Oxytocin in turns binds to its endometrial receptor, activating the synthesis and pulsatile release of endogenous PGF2α into the uterine ovarian vein and delivered directly to the CL resulting in the decease of the CL which in turn accelerate the delivery of the newborn(41) Table 2 also referred that sex of lamb effect on Pregnancy Length significantly (p≤ 0.05). Male births were higher than that of females 149.27, 150.25 respectively. This result was in accordance with the finding of Aoiyiola et al (8). Type of births also showed a significant difference (p≤ 0.05). pregnancy period in single births were higher than twin births . It is generally agreed of the single births is higher than the twins in the crossbred ewes treated with AVIKESIL-S® with eCG protocol in comparison with control group(46). Number of twins resulted in the current study may be related to the double ovulations and resulting twinning during sponge removal. Previous studies referred to the increased twinning rates in the ewes that treated with PMSG which may increase the number of follicles and therefore raised the twinning and triplet rates (31, 49). From table 2 it could also concluded that there is a highly significant (p≤ 0.01) regression on litter weight of births being -1.632day/kg which mean that increasing the litter births by 1 kg will decrease the pregnancy length by 1.632 day. This is may be due to an increase in the weight of the lambs and increased effort on the uterus, which leads to speeding in the secretion of hormones, related to the birth process and accelerates birth (27)

Table 2. Means ± Standard Error (S.E.) for the factors affecting on pregnancy length of ewes

Effects		No.	Pregnancy Length (days) Means ± S.E.
Over all mean		49	149.51 ± 0.16
Breed	Karadi	24	149.58 ± 0.25 a
	Arabi	25	149.44 ± 0.22 a
Treatments	T1	15	149.93 ± 0.28 a
	T2	16	149.56 ± 0.26 ab
	T3	18	149.11 ± 0.29 b
Interaction Karadi	T1	7	150.00 ± 0.53 a
	T2	8	149.75 ± 0.36 a
	T3	9	149.11 ± 0.42 a
Interaction Arabi	T1	8	149.88 ± 0.30 a
	T2	8	149.38 ± 0.38 a
	T3	9	149.11 ± 0.42 a
Sex	Male	24	149.27 ± 0.21 b
	Female	21	150.25 ± 0.20 a
	Male & Female	4	148.14 ± 0.26 c
Type of Birth	Single	42	149.74 ± 0.16 a
	Twin	7	148.14 ± 0.26 b
Regression on litter weight of births			-1.632 ± 0.42 **

a, b, c, Means within factor followed by different letters in the columns are significantly different (p≤ 0.05).
****Significant at level (p≤ 0.01)**

Weight at birth

The general average for the birth weight of the Karadi and Arabi breed (4.289 , 4.321 kg), as shown in table 3, and this result has agreed with what found (7) in the Arabi sheep. The difference in birth was due to a variation in the installation of genetic and phenomenos to the fetus (32).It is clear from table 3 that ther are significant (P<0.05) effect of the hormonal treatments on the birth weight of lambs in T1, T2, T3 averaged (4.413 ,4.220, and 4.310) respectively.This is similer to what (37) found in Awassi female lambs.The interaction between the breeds and treatments significantly affect the birth weight ,despite the superiority of the Arabi with T3 (4.430kg) over the rest. Flurogeston acetate (FGA) treatment increased birth weight significantly (p≤ 0.05) in Karadi and Arabi breeds (4.429 and 4.400 kg) respectively, While T3 group showed a significant reduction in birth weight in Karadi breed (4.200) Kg. In contrast Arabi

breed showed a significant reduction ($p \leq 0.05$) in birth weight (4.150) Kg in T2 group.These finding are similar to those reported by Maksimovic et al (31) . Differences in birth weight of lambs may be due to differences in the ewes age (5). Older ewes have better physiological situation, bigger size, and better functioning uterus than younger ages. younger ewes also, develop in size and weight and therefore consume energy for their growth and development, which might affect the birth weight of lambs produced by them (26). Male lambs at birth were 0.25 kg heavier ($P < 0.05$) than ewe lambs . This is in agreement with research conducted by Yilmaz et al (48).The superiority of male lambs over female lambs is due to the effect of the hormone testosterone secreted by males, which has an important role in muscle mass in males compared tofemales, so it is noted that males are huge,larg skeletons and physiological status (21). The different birth weight related to the differences in breed type significantly($p \leq 0.05$), the singular birth weight (4.662) were more as compard with twins birth weight (3.236).This similar to effects of birth type on lamb birth weight were observed by Arslan et al (9), may be related to the differences in age and body condition, and also to the nutritional factors, or systems of management (49). In the current study, the regression of birth weight on dam weight at birth was highly significant ($p \leq 0.01$) and being 78 g/kg which mean that increasing 1 kg of dam weight at birth will cause an increase of birth weight of their lambs by 0.078 kg (78 g). Similarly, Al-Barzanji (3) in Hamdani ewes. This may be due to the possibility that the heavier mothers provide their fetuses with greater amounts of nutrients during pregnancy compared to mothers of less weight, as well as providing a large space inside the uterus which gives a wide scope for growth and development of the fetus during the last period of pregnancy and this is reflected positively on the birth weight(37).

Table 3 Means ± Standard Error (S.E.) for the factors affecting on birth weight

Effects			No.	Birth Weight (Kg) Means ± S.E.
Over all mean			56	4.305 ± 0.09
Breed		Karadi	28	4.289 ± 0.14 a
		Arabi	28	4.321 ± 0.13 a
Treatments		T1	15	4.413 ± 0.11 a
		T2	20	4.220 ± 0.19 b
		T3	21	4.310 ± 0.16 ab
Interaction	Karadi	T1	7	4.429 ± 0.17 a
		T2	10	4.290 ± 0.26 ab
		T3	11	4.200 ± 0.24 b
	Arabi	T1	8	4.400 ± 0.16 a
		T2	10	4.150 ± 0.28 b
		T3	10	4.430 ± 0.22 a
Sex		Male	30	4.423 ± 0.13 a
		Female	26	4.169 ± 0.14 b
Type of Birth		Single	42	4.662 ± 0.06 a
		Twin	14	3.236 ± 0.05 b
Regression on dam weight at birth				0.078 ± 0.01 **

a, b, Means within factor followed by different letters in the columns are significantly different ($p \leq 0.05$).
****Significant at level ($p \leq 0.01$)**

The 14-days FGA treatment regimen combined with PGF 2α and PMSG increased estrus response, fertility rate and reduced pregnancy length in the treated ewes of Karadi and Arabi ewes with higher effect in the PGF 2α treated group regardless the type of the breed. FGA combined treatments with PMSG and PGF 2α reduced pregnancy length in comparison with FGA treatment alone.

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