

Effect of Human Chorionic Gonadotropin Injection on Some of Reproductive Parameters in Local Iraqi Ewes

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Abstract

Aims and Objectives: Evaluate the effect of hCG injection on some of the reproductive parameters in local Iraqi ewes during the breeding season. **Materials and Methods:** Thirty seven ewes with an average age of 2–4 years were studied, along with sexually mature, fertile rams. The experiment was conducted in Saqlawiyah, Al Anbar Governorate, during the period from September 1, 2023 to March 1, 2024. The animals were examined using ultrasonography to ensure that they were nonpregnant. The oestrus was synchronised using an intra vaginal sponge. After 14 days, an injection of 250 IU human chorionic gonadotropin (hCG) was administered to each ewe. Blood samples were drawn on day 0, before sponge insertion and on day 34 after sponge removal. Oestrogen, P4 and pregnancy associated glycoprotein (PAG) levels were measured. Reproductive performance (number of ewes in oestrus, oestrus rate, number of pregnancies, fertility rate, conception rate, pregnancy rate, number of lambs born, lambing rate, litter size, gestation length (days), barrenness rate and sex ratio) was evaluated. **Results:** The results showed an oestrus rate of 100%, with all ewes (29/29) exhibiting oestrus and becoming pregnant. The total number of lambs born was 30. The fertility rate, conception rate and pregnancy rate was 78%, the lambing rate was 81%, the litter size was 1,035, the length of gestation was 145 to 151 days, 12 male and 18 female lambs were born and the barrenness rate was 25%. Oestrogen levels increased in all animals to 89.53 pg/ml, while P4 was initially low at 1.85 ng/ml before the experiment. P4 increased on day 34 of pregnancy to 3.2 ng/ml. PAG level on day 34 of pregnancy was 45 ng/ml. **Conclusion:** Pregnancy rate, fertility rate, conception rate and lambing rate increased following the administration of hCG (250 IU/ewe), which also led to elevated P4 levels on day 34.

Keywords: Human chorionic gonadotropin, Iraqi ewes, oestrogen, P4, pregnancy-associated glycoprotein, reproductive parameters

INTRODUCTION

To control ewe reproduction, the sheep oestrus cycle must be induced, and lambing must occur during or after the season. This induction management is based on either several methods: Ram effect, photoperiod, and exogenous hormones (prostaglandin F_{2α}, melatonin, progesterone, prostaglandins, equine chorionic gonadotropin and human chorionic gonadotropin [hCG])(1). Reproductive effectiveness is increased by oestrus synchronisation; the goal is to alter the oestrus cycle so that lambs are generated in consistent batches, which will lower the expense of managing reproduction(2). During pregnancy, the ruminant placenta's fetomaternal interface produces pregnancy-associated glycoproteins (PAGs), which are then discharged into the intercotyledonary region(3). Sheep can be diagnosed with pregnancy early when PAGs are present in the mother's bloodstream(4). The hCG alone

and with P4 could improve the reproductive performance in ewes(5). Enhancing reproductive performance—reflected through consistent estrus rates, conception rates, fertility rates, pregnancy rates, lambing rates, litter size, and similar indicators—has been identified as a key advantage in boosting animal populations and improving the quality of offspring(6). Because of the low fertility rate and pregnancy rate in local Iraqi ewes, many protocols are used to rise the reproductive performance. Because the data regarding this aspect (Oestrus synchronisation with P4+hCG) are scanty. Therefore, this study is designed to evaluate the effect of

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hCG injection on some of the reproductive parameters in local Iraqi ewes during the breeding season.

MATERIALS AND METHODS

37 multiparous ewes with an average age of 2–4 years were studied. The average body weight of the animal (45.3 ± 6) kg. The experiment was conducted in Saqlawiyah/Al-Anbar Governorate from September 1, 2023 to March 1, 2024. Animals were isolated for 30 days before the start of the experiment, and the animals were assessed using transrectal ultrasonography (TRU) and transabdominal methods to confirm they were unoccupied. All necessary supplies were available in the field, including sheds and tools to conduct the experiment. The animals were kept in average conditions and fed barley. A therapeutic and preventive program and a vaccination program were installed; the animals were examined; they were dosed with anthelmintics and injected with ivermectin to prevent internal and external parasites, as well as a vaccine was injected to prevent enterotoxemia caused by bacterial infection. Estrus was synchronized with a vaginal sponge containing 60 mg P4 after 14 days, and 12 rams were placed for 5 days; additionally hCG 250 IU/ewe by intramuscular injection with 2 ml of diluent. All ewes came into estrus 24–48 hours after removal of the vaginal sponges and hCG injection. Blood samples of 5 ml were collected from the jugular vein with anticoagulation tubes on day 0 before sponge placement and on days(34) after sponge removal and transfusion to the laboratory, and then separated by centrifugation of the samples (4000 RPM for 15 min) and stored at -20°C until testing.

Oestrogen and progesterone concentrations were measured by COBAS (E-411). Roche, Inc., Switzerland Ovine PAG from day 34 PM esternal concentrations were determined utilizing ELISA technology. The kit is provided by Sunlong Biotech Co., Ltd, China. Reproductive performance (number of oestrus ewes, oestrus rate, number of pregnant ewes, fertility rate, conception rate, pregnancy rate, number of lambs born, lambing rate and litter size) were estimated by Tekin and Köse(7). A Chi-square test was conducted to analyse the reproductive parameters using SAS(8).

Ethical approval

All protocols agreed with regulations and orders by College of Veterinary Medicine, University of Fallujah, Al-Fallujah, Iraq.

RESULTS AND DISCUSSION

Reproductive performance in Iraqi ewes

The results of the present study showed that the oestrus rate was equal in all ewes that showed oestrus 37. Pregnant ewes were equal 29, and lambs born were 30. The fertility rate, conception rate and pregnancy rate was 78%, the lambing rate was 81%, the litter size was 1,035, the length of gestation was 145 to 151 days, 12 male and 18 female lambs were born and the barrenness rate was 25% [Figures 1, 2 and Table 1].



Figure 1: Transrectal ultrasonography images on day 0 showed the empty ewe at before treatment

Table 1: Reproductive parameters in experimental ewes

Reproductive parameters	Data
Number of oestrus ewes	37
Oestrus rate (%)	100
Number of pregnant ewes	29
Fertility rate (%)	78
Conception rate (%)	78
Pregnancy rate (%)	78
Number of lambs born	30
Lambs rate (%)	81
Litter size	1.035
Gestation length (days)	145–151
Barrenness rate (%)	25
Sex type	
Male	12
Female	18

Ewes' oestrous cycles last anywhere from 14 to 19 days on average, with an average of 17 days, for non-adult ewes; the first oestrous cycle often occurs at the start of the reproductive season, during which time ovulation takes place without any indications of oestrus, a condition known as silent oestrus(9). A 24–36 h. The oestrous period is typical; Sheep's oestrous cycles during the breeding season often last no more than 1 day, with breed-to-breed variations having no discernible impact on the animal's age(10). Tekin and Köse(7) reported that the oestrus rate was in 8.05% (58/69) in Awassi ewes. The fertility rate is largely dependent on season, animal health, nutrition, genetics, age and husbandry management(11). The fertility rate, conception rate and pregnancy rate was 78%, the lambing rate was 81%, the litter size was 1,035, the length of gestation was 145 to 151 days, 12 male and 18 female lambs were born and the barrenness rate was 25%(12). The rate of fertility was significantly higher Assaf than the Awassi breed during the autumn (1.44 and 0.78) %. But no differences and similar among seasonal was found(12). Pregnancy rate is one of the most important indices of reproductive performance, because it is the end result of reproductive and fertilization process

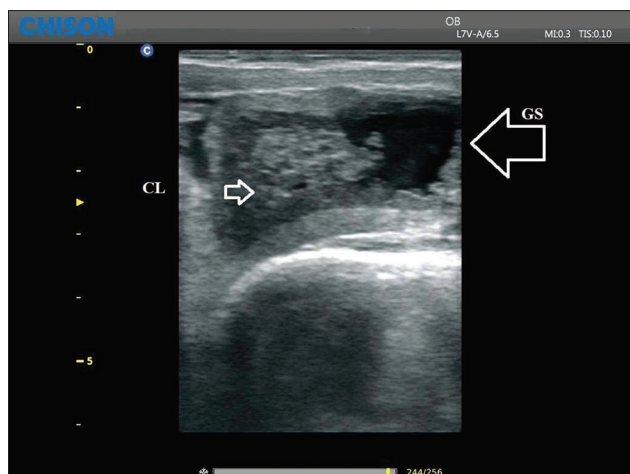


Figure 2: Transrectal ultrasonography images on day 34 of pregnancy ewe showed the foetus

in animals and is influenced by several contributing factors with either an increase or a decrease in the pregnancy rate(13). Yilmaz *et al.*(14) found that the body condition score had a significant impact on the pregnancy rate, as the pregnancy rate increased by 75.9% in body rates between 2.01 and 3.00, while the lowest rates for these traits were ≤ 1.5 . Heat stress also affects the pregnancy rate, as high temperature leads to a decrease in feed intake by the animal by 6%–34%, which has a negative impact on the pregnancy rate and its decrease in ewes(15). The conception rate can be raised by enhancing an animal's genetic potential or managing the environmental conditions that influence these features(16). Nutrition is an important factor in the Conception rate, Insufficient grazing pasture reduced the amount of feed resources available for sufficient ewe nutrition, which led to body weight loss, which prolonged the time between lambing and conception and, consequently, the lambing intervals. Improved nutrition and conception rate at first oestrus increased by 9%–16%(17). Gestation length is influence by the age, genotype, litter size, breeding season and nutrition of the ewe(16). The gestation period for Awassi ewes typically ranges between 148.7 and 152.7 days(18). The lambing rate is a useful gauge of its reproductive effectiveness(19). Variations in management approaches and genotypes may account for the variation in the interlambing period(20). To determine the effect of the breed, Zebari(16) find higher lambing rate significant differences in Awassi sheep (90%) and Kurdish sheep (84%). Heat stress also reduces the lambing rate by up to 80% due to embryo loss(15). Litter size is the most important genetic trait in ewes, which is influenced by hormones, ovulation rate and fecundity genes(21). The number of oocytes and the ovulation rate, which determine how many are released from follicles during ovulation, have an impact on litter size. This oocyte is enclosed by theca cells and granulosa cells that secrete progesterone and oestrogen hormones during ovulation(22). Litter size is ranged between 0.8 and 1.12(18). Parity and its impact, along with damage effects, on litter size in ewes(23). Research has shown that 4–8 years of age is considered the peak in fertility, and older ewes are considered to represent the highest flock production and profitability(17). The barrenness rate is considered one of the important criteria in

reproductive performance and is linked to several factors: including breed, environment, nutrition and others, Juma and Alkass(24) found higher barrenness rate of 25% in Awassi sheep.

Hormonal assay oestrogen, P4 and pregnancy-associated glycoprotein in experimental ewes

The results showed an increase in the level of oestrogen hormone in all experimental animals 89.53 pg/ml with a decrease in the level of P4 1.85 ng/ml before the start of the experiment. The level of P4 also increased on day 34 of pregnancy 3.2 ng/ml compared to day zero of pregnancy 1.85 ng/ml. The level of PAG on day 34 of pregnancy 45 ng/ml.

The findings of the study aligned with those of Kocakaya and Özbeyaz(25), as well as Al Marzani and Barwary(26), who also observed an increase in oestrogen levels during the oestrus phase. The significant growth of ovarian follicles and the rise in oestrogen production are closely associated with oestrus. The female ovarian sex hormone, oestrogen, plays a vital role in triggering behavioural oestrus in females. The activity of ovarian follicles is intricately linked to oestrogen secretion, which is stimulated by gonadotropin-releasing hormone(27). Internal theca cells in the follicle's antrum produce oestrogen, ultimately, blood vessels carried the absorbed oestrogen to its intended organ(28).

The result of the study agreed with(29) noticed that the P4 level increased in the 2nd and 3rd months and decreased in the 5th month of pregnancy. P4 is produced by biosynthesizing cholesterol, P4, particularly in the placenta and corpus luteum, P4 has a number of roles in the development of embryos, the oestrus cycle and pregnancy in particular. In addition, it affects how corticosteroids are metabolised, it is also closely related to oestrogen, P4 primes the uterus for implantation and lowers the mother's immunological response to enable the embryo's acceptance(30,31). Cycle P4 during the luteal phase is characterised by a rise in high temperature, which may indicate a decrease in P4 production or an increase in clearance, these factors may have an impact on the time and course of pre-ovulatory follicle growth(15). The CL secretes more P4 during the luteal phase of the cycle, which causes the P4 level to rise in the ovulatory animals, however, the P4 levels either stayed basal or climbed to a decreased level than that observed during the luteal phase of the cycle. Comparable outcomes have been seen in other studies employing intra-vaginal sponges containing progestagens and hCG injection, either with or without PGF2 α added(32,33).

The concentration of PAG in ewes was detectable at 4 weeks after mating and higher slowly from 3 to 9 weeks of pregnancy(34). From 9 weeks to 17 weeks, the plasma profiles of PAG in ewes exhibited variation. Starting at week 17 and continuing until lambing, these levels increased. After lambing, the PAG levels dropped rapidly, reaching their baseline value by 4 weeks postpartum(35). Akköse(36) observed the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of rapid visual PAG were 97.6%, 62.5%, 93.2%, 83.3%, 92% for pregnancy detection as of day 34 PM in Awassi ewes. Yotov and Sinapov(37) noted that PAG

values in pregnant ewes showed an increase between days 25–35 after artificial intelligence with higher mean values in pregnant than nonpregnant groups on day 35.

CONCLUSIONS

The use of hCG and administering a dose of 250 I.U. per ewe resulted in an increase in pregnancy rate (%), fertility rate (%), conception rate (%), and Lamb's rate (%), along with a higher P4 level observed on day 34.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Alhimaidei AR, Ammari AA, Alghadi MQ, Amran RA, Rady AM. Comparison between the CIDR or sponge with hormone injection to induce estrus synchronization for twinning and sex preselection in Naimi sheep. *Open Chem* 2023;21:1-7.
- Kuru M, Kuru BB, Kacar C, Can Demir MC, Cetin N. Effect of oestrus synchronization with different lengths of progesterone-impregnated sponges and equine chorionic gonadotropin on reproductive efficiency in Romanov ewes during the non-breeding season. *Acta Vet Brno* 2022;91:243-50.
- Sousa NM, Ayad A, Beckers JF, Gajewski Z. Pregnancy-associated glycoproteins (PAG) as pregnancy markers in the ruminants. *J Physiol Pharmacol* 2006;57 Suppl 8:153-71.
- Alkan H, Kivrak MB, Satilmis F, Tekindal MA, Dinc DA. Detection of twin pregnancies in ewes by pregnancy-associated glycoprotein assay and transabdominal ultrasonography. *Domest Anim Endocrinol* 2020;72:106399.
- Rostami B, Hajizadeh R, Shahir MH, Aliyari D. The effect of post-mating hCG or progesterone administration on reproductive performance of Afshari fsBooroola-Merino crossbred ewes. *Trop Anim Health Prod* 2017;49:245-50.
- Đuričić D, Benić M, Žaja IŽ, Valpotić H, Samardžija M. Influence of season, rainfall and air temperature on the reproductive efficiency in Romanov sheep in Croatia. *Int J Biometeorol* 2019;63:817-24.
- Tekin TC, Köse AM. Investigation of the effectiveness of ultrasonography in determining pregnancy and the number of fetuses on the 35th day of pregnancy in Awassi sheep. *J Adv VetBio Sci Tech* 2022;7:143-52.
- SAS. Statistical Analysis System. User's Guide. Statistical. Version 9. 6th ed. Cary. N.C., USA: SAS. Inst. Inc.; 2018.
- Bottino JP, Pérez-Clariget R, Rodriguez MG, Ratto M, Ungerfeld R. Multiple matings modify the estrous length, the moment of ovulation, and the estradiol and LH patterns in ewes. *Anim Reprod* 2021;18:e20210045.
- Yadav V, Saini G, Pandey AK, Kumar S. Neuro-endocrine mechanisms controlling reproductive seasonality in sheep: A review. *Pharm Innov J* 2021;10:160-5.
- Assan N. Effect of litter size (birth type) on milk yield and composition in goats and sheep production. *Sci J Anim Sci* 2020;9:635-43.
- Zaher HA, Alawaash SA, Swelum AA. Effects of season and breed on the reproductive performance of sheep. *J Anim Reprod Biotechnol* 2020;35:149-54.
- Vallejo DA, Londoño JD, Yepes YA, Tamayo V, Mejia AF, Maldonado JG. Pregnancy rates in hair sheep after ovsynch synchronization and a combined intracervical fixed-time artificial insemination and 10-day mating period. *Vet World* 2019;12:1779-83.
- Yilmaz M, Altin T, Karaca O, Cemal I, Bardakcioglu HE, Yilmaz O, *et al.* Effect of body condition score at mating on the reproductive performance of kivrak sheep under an extensive production system. *Trop Anim Health Prod* 2011;43:1555-60.
- van Wettene WH, Kind KL, Gatford KL, Swinbourne AM, Leu ST, Hayman PT, *et al.* Review of the impact of heat stress on reproductive performance of sheep. *J Anim Sci Biotechnol* 2021;12:26.
- Zebari HM. Factors that influence on reproductive efficiency in Karadi and Awassi sheep raised under traditional conditions. *J Univ Duhok* 2020;23:169-81.
- Assan N. Indicators of reproductive performance in goats and sheep meat production. *Sci J Anim Sci* 2020;9:608-19.
- Alkass JE, Hermiz HN, Baper MI. Some aspects of reproductive efficiency in Awassi ewes: A review. *Iraqi J Agric Sci* 2021;52:20-7.
- Ampong E, Obese FY, Ayizanga RA. Growth and reproductive performance of West African Dwarf sheep (Djallonké) at the livestock and poultry research centre, University of Ghana. *Livest Res Rural Dev* 2019;31:1-5.
- Gbangboche AB, Adamou-Ndiaye M, Youssao AK, Farnir F, Detilleux J, Abiola FA, *et al.* Nongenetic factors affecting the reproductive performance, lamb growth and productivity indices of Djallonke sheep. *Small Rumin Res* 2006;64:133-42.
- Ekiz B, Özcan M, Yilmaz A, Ceyhan A. Estimates of phenotypic and genetic parameters for ewe productivity traits of Turkish merino (karacabey merino) sheep. *Turk J Vet Anim Sci* 2005;29:557-64.
- Kumar S, Dahiya SP, Magotra A, Kumar S. Genetic markers associated with fecundity in sheep. *Int J Sci Environ Technol* 2017;6:3064-74.
- Kumar D, De K, Sejian V, Naqvi SM. Impact of climate change on sheep reproduction. In: Sejian V, Bhatta R, Gaughan J, Malik PK, Naqvi SM, Lal R, editors. *Sheep Production Adapting to Climate Change*. Ch. 3. Singapore: Springer Nature Singapore Pte Ltd, 2017. p. 73, 84.
- Juma KH, Alkass JE. Native goats of Iraq: A review. *Dirasat Agric Sci* 2005;32:180-8.
- Kocakaya A, Özbeyaz C. The effects of progesterone and estrogen hormone levels on some reproductive characteristics of the Akkaraman sheep. *KSU J Agric Nat* 2019;22 Suppl 2:424-30.
- Al-Marzani EA, Barwary MS. Effect of different estrus synchronization on serum E2, P4, FSH and LH during different estrus periods and pregnancy in ewes. *Iraqi J Agric Sci* 2022;53:743-51.
- Tanjung AD, Setiatin ET, Samsudewa D. Level of estrogen hormone and estrus performance of different postpartum estrus of Jawarandu goat. *J Indonesian Trop Anim Agric* 2015;40:87-92.
- Senger PL. Placentation, gestation and parturition. In: *Pathways to Pregnancy and Parturition*. 3rd ed., Ch. 14. USA: Current Conceptions, Inc.; 2012. p. 304.
- Zarkawi M. Monitoring the reproductive performance in awassi ewes using progesterone radioimmunoassay. *Small Rumin Res* 1997;26:291-4.
- Faye B, Bengoumi M. *Camel Clinical Biochemistry and Hematology*. Faye B, Bengoumi M., Springer International Publishing AG, Part of Springer Nature; 2018. p. 306-7.
- Omar AA, Mohammed TR, Al-Kubaisi SM. Progesterone levels during pregnancy in ewes treated with bone marrow stromal cells. *Al Anbar J Vet Sci* 2019;12:105-8.
- Alwan AF, Amin FA, Ibrahim NS. Blood progesterone and estrogen hormones level during pregnancy and after birth in Iraqi sheep and goat. *Basrah J Vet Res* 2010;9:153-7.
- Sangeetha P, Rameshkumar K. Observation of biochemical variations in sheep (*Ovis aries*) during different reproductive phases. *Res J Anim Vet Fishery Sci* 2014;2:13-6.
- Ranilla MJ, Sulon J, Carro MD, Mantecón AR, Beckers JF. Plasmatic profiles of pregnancy-associated glycoprotein and progesterone levels during gestation in churra and merino sheep. *Theriogenology* 1994;42:537-45.
- Gajewski Z, Beckers JF, Melo de Sousa NM, Thun R, Sulon J, Faundez R. Determination of pregnancy associated glycoprotein concentrations in sheep: A retrospective study. *Adv Cell Biol* 1999;26 Suppl 12:89-96.
- Akköse M. Evaluation of a bovine rapid visual PAG ELISA test and transabdominal ultrasonography for early pregnancy diagnosis in awassi sheep. *KSU J Agric Nat* 2020;23:1366-72.
- Yotov S, Sinapov B. Effect of GnRH administration on pregnancy associated glycoproteins in dairy sheep with different reproductive status. *Acta Sci Vet* 2023;51:1 8.