J.Animal and Poultry Prod., Mansoura Univ., Vol.10 (5): 121- 125, 2019

Effect of Different Equine Chorionic Gonadotrophin (eCG) Doses on Does and their Kits Reproductivity of Hybrid Rabbits

Bana M. Sarwar* and Chowman A. Omar

Department of Animal Science, College of Agricultural Science Engineering, University of Sulaimani, Sulaimani, Iraq

*** Corresponding author. E-mail: banamohamad@yahoo.com**

ABSTRACT

This study was conducted to assess the effect of Equine Chorionic Gonadotrophin (eCG) injection on the doe reproductive and their kits productivity traits of hybrid rabbits. The experiment was carried out at the animal farm, College of Agricultural Sciences, University of Sulaimani, during spring (March to July) of 2018. A total of (48) forty-eight does and (24) twenty-four fertile bucks' rabbits were randomly assigned to a completely randomized design, arrangement of four treatments (12 does/treatment) with allotted into 3 three replicates, which included; control: without injection (T1), positive control: with buffer saline (T2), T3: eCG (10 IU) and T4: eCG (20 IU) injected intramuscularly, and they were housed in a semi-closed rabbitry housing system. Data on the parameters studied were collected on an individual does in each group. The reproductive and productivity traits were measured by the number of weaned rabbits. The results showed that eCG dose (T3 and T4) decreasing in gestation period GP as compared to control groups which were higher significantly ($p \leq 0.05$). The kindling rate significantly exceed in injected group T3 when it compared to control groups, and with no significant differences with T4. For litter size (LS) at 7, 21, and 28 days (at weaning) T4 has significant exceed when it compared to control T1 and T2. While significant differences emerged of T4 for live weight at LW7, LW21, and LWW, respectively. And the T3 exceed significantly on the control (66.06±3.46 g/kit) for LW7, the control at LW21 and LWW. In conclusion, using eCG hormone in hybrid rabbits (T3) resulted in increasing doe reproductive and their kits productivity performance during the suckling period and proved to be an efficient way to increase production.

Keywords: Hybrid rabbit, eCG hormone, Does reproductively, Litter Size, Kits Mortality.

INTRODUCTION

The rabbit production plays a considerable role in solving the problem of meat shortage due to the rabbit meat is high-quality protein content, and contains a high percentage of minerals than other meat types (Seleem *et al.,* 2007). The rabbits compared to other livestock animals are characterized by early sexual maturity, high prolificacy, relatively short gestation period, short gestation interval, rapid growth, more efficient feed conversion and low rearing cost (Cheeke *et al.,* 1982). Consequently, the optimization of reproductive performance is one of the main facts that assure high productivity on rabbit farms (Friggens, 2003). In general, establishing an abundant source of oocytes and embryos of farm animals is one of the main problems in cryoconservation of oocytes and embryos. To ensure the maximum number of normal embryos recovered per donor in rabbit does, treatments with Pregnant Mare Serum Gonadotropin (PMSG) which is now called Equine Chorionic Gonadotrophin (eCG) are used to induce superovulation (>50 IU) or to induce estrus (10-40 IU) before artificial insemination (Theau-Clément, 2007). Theau-Clément *et al.* (2008a) reported that when eCG injected at 8-25 IU to rabbit does, the number of receptive does, kindling rate and the number of weaned rabbits per insemination, as well as the number of corpora lutea in ovulating does and survival embryos are increased. This molecule is a glycoprotein with a mass estimated between 45 and 64 kDa (Drion *et al.*, 1998). It is extracted from the serum of pregnant mares. It is a dimerous hormone with both an FSH and LH activity. Its major FSH effect was used to induce and multiply the ovulations (superovulation) first in the cow (Avery et al., 1962), then in laboratory animals (Chang and Pickworth, 1969), including the rabbit (Kennelly and Foote, 1965). In farms, is not easy to identify the sexual receptivity, while it is an important criterion of the rabbit productivity prediction. The sexual receptivity and cycled production incompatible together in the rabbit. Consequently, to improve the sexual receptivity of rabbit, different strategies have been treated (Theau-Clément, 2007). After that, in these last 15 years, hormonal treatments have been largely used by breeders who have chosen to use AI and a single batch breeding system, especially eCG. Mehaisen *et al.*, 2006 and Viudes De Castro *et al.*, 2009, they reported that routine use of high doses of eCG in subsequent inseminations of rabbits decreased the fertility due to the possible increase in anti-gonadotropin antibodies in treated rabbits. Therefore, the present study was performed to determine the effect of different levels of eCG hormone on the does' reproductive performance and their kits productivity traits of Hybrid rabbits receiving 10 or 20 IU of eCG, 2 days before insemination.

MATERIALS AND METHODS

Animals and experimental design:

This study was performed in Bakrajo field's directory, animal science department, college of agricultural sciences, Sulaimani University during March – July 2018. (72 rabbits, 48 does and 24 bucks) of hybrid rabbits as a total number at 14 weeks old were used. During the experience, each rabbit was housed in an individual cage (60×50×35cm) supplied with plastic sheet hoppers for feeding, drinkers made of automatic nipples and only for does with internal nest boxes. The nest boxes were supplied with carpets wool or wooden straw to help the doe in preparing a worm comfortable nest for her kits on the last three days before kindling. According to their physiological condition, rabbits received 150 g/day commercial concentrate pellets. Chemical composition and formulation ingredients' diets are presented in Table 1, with water was provided *ad libitum* at all time. For the hormonal treatment, the does were randomly divided into 4 equal groups (12 does/treatment) and each group was allotted into 3 replicates, control: without injection (T1), positive control: with buffer saline (T2), T3: eCG (10 IU) and T4: eCG (20 IU) injected intramuscularly. 48 hours before the first natural insemination except T1, the does received a subcutaneous injection of 10 IU (T3) or 20 IU (T4) of eCG (Chronogest - INTERVET) in 1 mL of solvent and the dose of the positive control group was received buffer saline (T2). Prior to insemination, sexual receptivity of the does was tested in the presence of a buck.

A doe was considered as receptive if she took a lordosis position.

Table 1. Formulation and chemical composition of the experimental diet on dry weight basis.

Ingredients	(%)	Chemical composition	(%)
Barley Grain	14	Dry matter (DM)	91.3
Wheat Barn	32	Crude protein (CP)	16.4
Yellow Corn	10	Ether extract (EE)	2.72
Soybean meal	12.5	Total Ash	8.4
Hay	28	Crude fiber (CF)	14.5
Sun flower oil	1.5	Digestible energy DE(Kcal/Kg)*	2567
Salt (NaCl)	1		
Minerals and vitamins	0.5		
Dicalcium Phosphate	0.5		

***DE (Kcal/Kg) was estimated using the equation according to Fekete and Gippert (1986) as: DE (kcal/kg DM): 4253–32.6×Crude fiber (% DM)–144.4×Ash (% DM).**

Study Characteristics:

The reproductive performance was compared based on the pregnancy rate. Data on the parameters studied were collected on an individual does in each group. The global productivity was measured by the number of weaned rabbits. The reproductive and productive traits to be studied were:

Conception rate: Number of conceived does/number of mated does × 100

Gestation Period (day): the interval between conception and kindling.

Kindling rate: number of kindling does/number of mated does × 100

Litter size: recorded at birth (Total and live), 7, 21, 28 (weaning) days after birth (Live kits).

Mortality at birth (Stillbirth): Kits born dead

Pre-weaning mortality = $LSB - LSW/LSB$ (Total) ×100.

Litter Weight: recorded at birth, 7, 21 days after birth and at weaning (28 days).

Average Daily Gain (ADG) from birth until 7 days = $LW7 - LWB/7$.

ADG from 7 days until 21 days = $LW21 - LW7/14$

ADG from 21 days until weaning = $LWW - LW21/7$.

Where: Litter Size at Birth (LSB), Litter Size at Weaning (LSW), Litter at Weaning (LW) and Litter Weight at Weaning (LWW).

Chemical Analysis of commercial concentrate pellets:

Proximate chemical analysis of concentrate pellet samples in triplicate per each determination was carried out for dry matter (DM), crude protein (CP), ether extract (EE), crude fiber (CF) and ash content according to the AOAC (1995).

Statistical analysis:

The data were analyzed by analysis of variance (ANOVA) using the General Linear Model (GLM) within the statistical program Complete Randomized Design (CRD) procedures of XLstat. (Addinsoft, version.5.03, 2014) in one-way ANOVA to analyze the factor affecting reproductive performance of does and productive traits for the newborn within the (CRD) Complete Randomized Design for different levels of eCG hormone under the probability ($p \leq 0.05$). Results are presented as means and standard error of means and group differences were determined using Duncan's multiple range tests at ($p \leq 0.05$) (Duncan, 1955).

RESULTS AND DISCUSSION

The effect of different doses eCG injection on Conception rate %, Gestation period (G. P/ day) and Kindling rat% of Hybrid rabbit does are presented in Table 2. The conception rate was recorded no significant difference, despite the higher ratio in both eCG injection treatments T_3 and T_4 (92% and 83%, respectively), as compared to the control groups (67% and 58% for T1 and T2, respectively). Statistically, the gestation period GP of doses of the control groups (T_1 and T_2) were higher significantly ($p \leq 0.05$) than does treated with eCG (T_3 and T_4), which recorded 29.82±0.38 and 29.44±0.34 days, respectively, when it compared to 31.67±0.21 and 31.83±0.31 days for T1 and T2, respectively. The kindling rate significantly ($p \leq 0.05$) exceed in injected group (10 IU, of eCG hormone) of the group (T3) when it compared to control groups (T1 and T2), which were 92.00±0.08% vs 50.00±0.15% and 50.00±0.15%, respectively, and with no significant differences with T_4 (20 IU injected eCG).

In accordance with the present results of conception rate thereabout the result of Theau-Clément *et al*. (2008a and 2008b), were reported that the sexual receptivity of does improved by an injection of 8 or 25 IU of eCG 48 hours before insemination (eCG Group 0 IU (54.1%), 8 IU (84.2%) and 25 IU (84.6%) ($P \leq 0.05$) and they increased the conception rate. On the contrary to Mehaisen and Abbas, (2014), demonstrated that increases in eCG hormone to (50 IU) per dose decrease the conception rate from 100% to 68.4% for the control and eCG group (50 IU), respectively. The overall mean of conception rate (75.00±0.06%) in the present study was higher than reported by Lebas *et al.,* (1996) and Elkomy and El-Speiy (2015) (42.0 and 67.54%, respectively). The results of GP is in opposition with Mehaisen and Abbas, (2014) which reported that gestation period increased significantly by increasing eCG dose (Control: 29.8 ± 0.1 days and eCG (50 IU): 32.3 ± 0.2 days). The overall mean of gestation period (30.44±0.25 days) in the current study is in agreement with that reported by Heba-T-Allah *et al. (*2016), which was used in New Zealand white breed.

As Theau-Clément *et al*. (2008a) have already evidenced that kindling rate of a control group does were weaker than those treated with eCG (8 or 25 IU), but the increase of eCG dose has no significant effect on kindling rate. On the other hand, Mehaisen and Abbas, (2014) reported that the kindling rate of eCG treated does lower than non-treated dose (52.6 and 81.3 %), respectively. The overall mean of the kindling rate in the present study was higher than presented before by El-Ratel *et al.* (2017). These results indicate that eCG hormones injection 10 to 20 IU give the best results for does productivity. And high productive and reproductive with little mortality are the primary focus of rabbit producers, therefore, high conception rate and kindling rate with short gestation period in this study highlight the favor of using eCG. It can be deduced that a complex hormonal system is regulated doe reproduction in which hypothalamus and pituitary gland play a leading role in the secretion of GnRH can stimulate both the FSH and LH in order to solve poor fertility of the doe rabbits the systemic use of gonadotrophin hormones is widespread in rabbit farms (Sakr, 2003).

Table 2. Effect of different levels of eCG injection on Conception rate, Gestation Period (GP) and Kindling rate.

Parameters	Overall Mean	T1 (without injection)	T2 (Buffer Saline)	T3 (10 IU)	T4 (20 IU)
Conception Rate (%)	75.00±0.06	67.00±0.14^{a}	58.00±0.15^{a}	92.00±0.08^{a}	83.00±0.11^{a}
GP (Days)	30.44±0.25	31.67±0.21^{a}	31.83±0.31^{a}	29.82±0.38^{b}	29.44±0.34^{b}
Kindling rate (%)	67.00±0.07	50.00±0.15^{b}	50.00±0.15^{b}	92.00±0.08^{a}	75.00±0.13^{ab}

Means in rows with different letters are significantly different (p≤0.05).

The table (3) have shown the effect of different levels of eCG hormone doses on Litter size at birth at 7, 21 and 28 days (at weaning), as well the mortality rate at birth and pre-weaning mortality. There was a significant difference (p≤0.05) between T_2 treated with eCG 20 IU (6.00±0.62 and 5.11±0.48) and positive control group (buffer saline) (3.83±0.76 and 2.67±0.33) of total LSB and live LSB respectively. For litter size, LS at 7, 21, and 28 days (at weaning) 20 IU dose of eCG has significant exceed when it compared to T1 and T2. In accordance with the present results of the effect of eCG doses on the mortality rate at the birth (stillbirth) and pre-weaning mortality rate which presented in table 3, there was a slight difference between all groups but not significantly (p≤0.05).

The overall mean of litter size at birth LSB, at 21 days and at weaning (28 days) were lower than litter sizes of New Zealand white and Hyplus breed at natural mating which presented by Heba-T-Allah *et al. (*2016), also lower than litter size at birth (Total and Live) of Hyplus breed in Artificial Insemination which reported by Lebas *et al.* (1996), and lower than litter size at birth which reported by Elkomy and El-Speiy (2015) and Oliveira *et al.,* (2011), and in line with results presented by Oguike and Okocha (2008) in Dutch and Chinchilla crosses rabbit breeds of litter size at birth and at weaning. However, higher than results presented by El-Ratel *et al.* (2017) and Kalaba and Abdel-Khalek (2011) in New Zealand White rabbit does and California rabbit does of litter size at birth (Total and Live), respectively, and at weaning in New Zealand White rabbit does (El-Ratel *et al.*, 2017). This significant difference between groups for litter size in the present study can be due to the administration of a Gonadotrophin-releasing hormone (GnRH) analog, which leads to increasing the number of the released follicles leading to significant increase in litter size. In opposite of this, Theau-Clément *et al*. (2008a and 2008b) presented that eCG does not have a significant effect on the litter size at birth or at weaning. However, the distribution of the litter size was more homogeneous for group 0, 8 and 25 IU of eCG. On the contrary, Mehaisen and Abbas (2014) demonstrated that the litter size at birth and at weaning significantly (P<0.05) decreased in eCG group (50 IU) in comparison with control group.

In contrast with this result, Mehaisen and Abbas, (2014) illustrated that although the use of eCG (50 IU) high doses appears to ensure sexual receptivity and abundant source of normal embryos in receptive donor does, it shows a negative consequence on the productivity and final yield of weaned rabbits, where a significantly lower number of stillborn was recorded for control group than eCG group. The overall mean of mortality rate in this study they showed a lower percent at the birth (stillbirth) and pre-weaning mortality rate (0.20±0.03 and 0.41±0.05, respectively) when we compared to that recorded by Lebas *et al.* (1996), Oguike and Okocha (2008), Theau-Clément *et al*. (2008a and 2008b) and Oliveira *et al.* (2011), While higher than recorded by Heba-T-Allah *et al. (*2016).

Table 3. Effect of different levels of eCG injection on Litter size at birth, 7, 21 days and at weaning and on mortality rate at birth and pre-weaning periods.

Parameters	Overall Mean	T1 (without injection)	T2 (Buffer Saline)	T3 (10 IU)	T4 (20 IU)
Total LSB (No.)	5.00±0.35	3.83±0.76^{ab}	3.83±0.76^{b}	5.45±0.56^{ab}	6.00±0.62^{a}
Live LSB (No.)	4.06±0.34	3.17±0.48^{ab}	2.67±0.33^{b}	4.45±0.72^{ab}	5.11±0.48^{a}
LS 7 (No.)	3.53±0.33	2.50±0.72^{b}	2.17±0.31^{b}	3.73±0.56^{ab}	4.89±0.54^{a}
LS 21 (No.)	3.25±0.32	2.33±0.76^{b}	2.00±0.45^{b}	3.45±0.51^{ab}	4.44±0.58^{a}
LSW 28 (No.)	3.09±0.32	2.17±0.83^{b}	1.67±0.56^{b}	3.36±0.45^{ab}	4.33±0.53^{a}
MB (%)	0.20±0.03	0.16±0.07^{a}	0.26±0.06^{a}	0.22±0.04^{a}	0.15±0.04^{a}
PWM (%)	0.41±0.05	0.48±0.17^{a}	0.60±0.14^{a}	0.37±0.05^{a}	0.29±0.06^{a}

Means in rows with different letters are significantly different (p≤0.05).
LSB=Litter Size at Birth, LS7=Litter Size at 7 days, LSW28=Litter Size at Weaning 28 days, MB=Mortality at Birth, PWM=Pre Weaning Mortality.

The overall mean of litter weight at birth LWB, 7, 21 and 28 days (at weaning) of rabbit does inject by different levels (10 and 20 IU) of eCG were shown in the table (4). There was no significant difference in LWB between the groups. While significant differences (p≤0.05) emerged in the present study of T4 (20 IU eCG), which recorded (88.56±2.63, 257.29±9.45 and 417.78±13.44 g/kit) for LW7, LW21, and LWW respectively. In addition, the T3 (10 IU eCG) exceed significantly on negative control (66.06±3.46 g/kit) for LW7, and then T1 and T2 control at LW21 and LWW. The average daily gain ADG for 1-7, 7-21 and 21-28 (until weaning) were shown in the table (4), and the significant differences recorded on T3 and T4 as compared to control groups. At 1-7 days the ADG significantly differences that recorded (6.61±0.35 g/day) with T4 and T1 (4.09±0.24 g/day). Also, the significant differences recorded in ADG (7-21 days) for T4 (12.05±0.62 g/day) and T3 (9.13±0.52 g/day), and it has surpassed on negative and positive control groups (6.60±0.11 and 5.55±0.12 g/day, respectively. On the other hand, there were no significant differences recorded in ADG 21-28 days between groups. In the present study, the overall mean of LWB (40.34±1.28 g/kit) was lower than presented by Elkomy & El-Speiy (2015) (46.31 g) and Oliveira *et al.* (2011) (56.1 g) in New Zealand White rabbits. In addition to that LWW litter weight at 28 days

(weaning) were also lower than reported by Oliveira *et al.* (2011) (650 g) in New Zealand White rabbits and Lebas *et al.,* 1996 (692g). While there were a highly significant ($p \leq 0.05$) differences between non treated groups and treated groups with eCG hormone doses and the increase of eCG from 10 IU to 20 IU eCG, which increases the litter weight at 7, 21 and 28 days, in opposite with presented by Theau-Clément *et al*. (2008a), consequently, does treated with 25 IU of eCG showed a significantly lower litter weight at weaning when compared with those treated with 8 IU (Theau-Clément *et al*., 2008b), and they presented that the eCG treatments failed to have any ameliorative or deteriorating effect, on the litter weight at birth, in line with recorded by Theau-Clément *et al*., (2008a). This result was reasonable regarding that the eCG hormone doses has no effect on litter weight at birth; and that litter weight from 7 and 21 days until weaning was affected by eCG hormone dose. Such results may indicate the highest litter performance and litter weight of kits produced and reared by does treat with eCG hormone dose (20 IU eCG).

Table 4. Effect of different levels of eCG injection on Litter weight at birth, 7, 21 days and at weaning (g/kit) and average daily weight gain (ADG) in hybrid rabbits kits.

Parameters	Overall Mean	T1 (without injection)	T2 (Buffer Saline)	T3 (10 IU)	T4 (20 IU)
LWB (g/kit)	40.34±1.28	37.67±1.63^{a}	37.75±3.02^{a}	41.63±2.87^{a}	42.29±1.80^{a}
LW7 (g/kit)	79.74±1.94	66.06±3.46^{c}	77.13±3.16^{b}	80.16±2.65^{b}	88.56±2.63^{a}
LW21 (g/kit)	205.18±8.62	158.40±2.59^{c}	151.88±3.57^{c}	208.05±8.58^{b}	257.29±9.45^{a}
LWW (g/kit)	365.14±10.27	308.00±4.28^{c}	298.63±8.70^{c}	367.05±9.44^{b}	417.78±13.44^{a}
ADG 1-7 (g/day)	5.62±0.27	4.09±0.24^{b}	5.63±0.83^{ab}	5.50±0.37^{ab}	6.61±0.35^{a}
ADG 7-21 (g/day)	9.11±0.52	6.60±0.11^{c}	5.55±0.12^{c}	9.13±0.52^{b}	12.05±0.62^{a}
ADG 21-28 (g/day)	22.35±0.33	21.25±0.30^{a}	21.15±0.74^{a}	22.71±0.33^{a}	22.93±0.83^{a}

Means in rows with different letters are significantly different ($p \leq 0.05$).
ADG=average daily gain, LWB= Live Weight at Birth, LW7= Live Weight at 7 days, LW21= Live Weight at 21 days, LWW= Live Weight at Weaning.

Regarding average daily weight gain (ADG) in Hybrid rabbit kits produced by does treat with different levels of eCG hormone dose, the overall mean was (5.62±0.27, 9.11±0.52 and 22.35±0.33 g/day) from 1-7, 7-21 and 21-28 days, respectively (Table 4). In the studies carried out by Oliveira *et al.* (2011); Szendrö *et al.* (2005); Bonanno *et al.* (2005); Matics *et al.* (2005) and Eiben *et al.* (2004), the average weight gain was higher than the current study results. The overall mean of ADG of Hybrid rabbit kits at weaning (22.35±0.33 g/day from 21-28) is lower than the overall mean of Hyplus breed ADG (23.34±0.79 g/day from 21-28) and higher than the overall mean of New Zealand white breed ADG (20.56±0.88 g/day from 21-28) which was presented by Heba-T-Allah *et al., (*2016). These results may be returned to the effect of breed, age or environment. While there were significant ($p \leq 0.05$) differences between none treated groups and treated groups with eCG hormone doses from 1-21 days and the increase of eCG (from 10 IU to 20 IU eCG) dose significantly increase the average daily weight gain from 1-21 days. There was a slight difference between groups for ADG from 21-28 days, but not significant ($p \leq 0.05$). This result was expected due to the increased litter size related to eCG hormone dose. In all time (from birth to weaning) the increase of eCG hormone (from 10 IU to 20 IU eCG) dose lead to increase the ADG if significant or not. On the other hand, the ADG increased from birth to weaning by increasing kits age.

CONCLUSION

High reproductive and productive with little mortality are the primary focus of rabbit producers. In the current study, using eCG hormone dose (10-20 IU) in Hybrid rabbit does resulted in increasing reproductive and productive performance of rabbit does during the suckling period and proved to be an efficient way to increase production, but further research is required to confirm and extend current findings because many aspects remain unknown or poorly understood.

ACKNOWLEDGMENTS

The authors gratefully thank the animal farm research station of Animal Science Department, College of Agricultural Sciences, University of Sulaimani at Bakrajo for the financial and technical support of this research project.

REFERENCES

Addinsoft. XLstat. Pro version 2014.5.03. http: // www. xlstat. com/en/ho.

AOAC.1995. Association of Official Analytical Chemists, Official Methods of Analysis, 14t^{h} ed. Washington, DC, 1018.

Avery, T.L., M.L. Fahning and E.F Graham. 1962. Investigations associated with the transplantation of bovine ova. II. Superovulation. J. Reprod. Fert., 3, 212.

Bonanno, A., F. Mazza, A. Di Grigoli and G. Tornambè. 2005. Both 48-hour doe-litter separation and 2-day controlled suckling improved fertility of 11-day lactating does similarly to 20 IU of PMSG. Cost Action 848. Joint Scientific Meeting: Management and housing of rabbit does: reproductive efficiency and welfare interactions. June 23-25, Palermo, Italy.

Chang, M.C. and S. Pickworth. 1969. Egg transfer in the laboratory animal. In: The Mammalian Oviduct (ed. E. S. E. Hafez and R. J. Blandau), University of Chicago. Press, Chicago.

Cheeke, R.P., N.M. Patton and G.S. Templeton. 1982. *Rabbit Production*, 5th ed., Danville, Illinois, U.S.A.: The Interstate Printers & Publishers, Inc.

Drion, P.V., B. Remy, J.Y. Houtain, M. Mc Namara, G. Baril, Y. Heyman, Y. Cognie, M. Theau-Clément, B. Leboeuf, F. Ectors, K. Segers and J.F. Beckers.1998. Utilisation répétée des gonadotropins exogènes dans le contrôle de la reproduction: justifications, relations structure-activité biologique, effets secondaires potentiels. Une synthèse. Ann. Méd. Vét., 142:373-396.

Duncan, D.C., 1955. Multiple Range and multiple F-test. Biometrics, 11: 1-42.

Eiben, Cs., K. Kustos, K. Gódor-Surmann, Sz. Kotány, M. Theau-Clément and Zs, Szendrö. 2004. Effect of nursing methods on productivity in lactating rabbits. In Proc.: 8th World Rabbit Congress, September 7-10, Puebla, Mexico, 263-269.

Elkomy, A. E. and M.E. El-Speiy, 2015. Polyunsaturated Fatty Acids Combined with Equine Chorionic Gonadotropin to Enhance Reproductive Performance in Aged Rabbit Does, Italian Journal of Animal Science, 14:1, 3535, DOI: 10.4081/ijas.2015.3535

El-Ratel, I.T., T.M. Dorra, M.A. Sheteif. and A.M. Mansour, 2017. Reproductive Performance of Doe Rabbits as Affect by GNRH Analogue Injection at Different Post-partum Days. Asian Journal of Animal and Veterinary Advances, 12:103.108

Fekete, S. and T Gippert. 1986. Digestibility and nutritive value of nineteen important rabbit feedstuffs. J. Applied Rabbit Res., 9: 103-108.

Friggens, N.C. 2003. Body lipid reserves and the reproductive cycle: towards a better understanding. Livest. Prod. Sci. 83, 209–226.

Heba-T-Allah, A.M., M.M Osman, A.I. Elsheikh and G.H. Chen. 2016. Mating Technique and Its Effect on Productive and Reproductive Traits in Rabbits. Journal of Advanced Agricultural Technologies Vol. 3, No. 2 :128-131 ppt.

Kalaba, Z.M. and A.E. Abdel-Khalek. 2011. Reproductive Performance of Rabbit Does and Productivity of their Kits in Response to Colour of Light. Asian Journal of Animal and Veterinary Advances, 6: 814-822.

Kennelly, J.J. and R.H. Foote. 1965. Superovulatory responses of pre-and postpuberal rabbits to commercially available gonadotrophins. J. Reprod. Fert., 9:177-188.

Lebas, F., M. Theau-Cle´ment, B. Remy, P.Drion and J.F. Beckers .1996. Production of anti-PMSG antibodies and its relation to the productivity of rabbit does. World Rabbit Science, 4 (2):57-62.

Matics, Zs., Zs. Szendrõ, M. Theau-Clément, E. Biró-Németh, I. Radnai, M. Gyovai, Z. Orova and Cs. iben . 2005. Modification of the nursing system as a biostimulation method. World Rabbit Sci., 13, 287.

Mehaisen, G.M.K. and A.O. Abbas. 2014. Effect of hormonal eCG treatment versus rearing-fasting program on embryo recovery, reproductive performance and hormonal profile in Nulliparous Rabbit does. Egyptian J. Anim. Prod., 51(1):27-34

Mehaisen, G.M.K., M.P. Viudes de Castro, J.S. Vicente and R. Lavara. 2006. In vitro and in vivo viability of vitrified and non-vitrified embryos derived from eCG and FSH treatment in rabbit does. Theriogenology, 65: 1279 – 1291.

Oguike, M.A. and N.L. Okocha. 2008. Reproductive performance of rabbits re-mated at different intervals post-partum. African Journal of Agricultural Research. 3 (6):412-415, Available online at http://www. academicjournals. org/ AJAR

Oliveira, A.F.G., C. Scapinello, M.C.P Leite, A.C.M. Motta, J.L. Figueira, F. Catelan and M. Retore. 2011. Evaluation of the reproductive performance of rabbits does fed a half-simplified diet based on cassava byproducts. Revista Brasileira de Zootecnia., 40(11):2456-2461.

Sakr, O.M. 2003. Effect of different mating system on reproductive and productive efficiency of rabbits. Master thesis, Faculty of Agriculture, Cairo University.

Seleem, T.S., H.M. Fayek, K.H. El-Kholy and S. M. Afifi. 2007. Rabbit productivity and reproductivity as influenced by prebiotics in drinking water. presented at the 4th World Poultry Conference, Sharm El-Sheikh, Egypt, March 27-30.

Szendrõ, Zs., Zs. Matics, Zs. Gerencsér, M. Gyovai, E. Biró-Németh and I. Radnai. 2005. Effect of lighting and biostimulation on performance of rabbit does. 2. Effect of nursing method. In Proc.: 17th Hungarian Conference on Rabbit production, Kaposvár, 79-82.

Theau-Cle´ment, M., F. Lebas, J.F. Beckers and P.V. Drion. 2008b. Evolution of anti-eCG antibodies in response to eCG doses and number of injections. Relationship with productivity of rabbit does. Animal, 2:5, 746–751.

Theau-Clément, M. 2007. Preparation of the rabbit doe to insemination: A review. World Rabbit Science, 15: 61– 80.

Theau-Clément, M., F. Lebas, Boiti C., G. Brecchia and P. Mercier. 2008a. Influence of different eCG doses on sexual receptivity and productivity of rabbit does. World Rabbit Science, 16: 65 – 72.

Viudes De Castro, M.P., C. Cortell, E. Moce, F. Marco-Jimenez, T. Joly and J.S. Vicente. 2009. Effect of recombinant gonadotropins on embryo quality in superovulated rabbit does and immune response after repeated treatments. Theriogenology, 72: 655 – 662.

تأثير حقن جرعات مختلفة من هرمون التناسلية للمشيمة الخيلية (eCG) على الصفات الإنتاجية للأمهات والمواليد في الأرانب الهجينة

بانه محمد سروه ر و جومان علاء الدين عمر

قسم علم الحيوان ، كلية الزراعة ، جامعة السليمانية ، السليمانية ، إقليم كوردستان العراق

أجريت هذه الدراسة لتقييم تأثير حقن هرمون التناسلية الخيلية المشيمية eCG على قدرة الأناث التناسلية و الصفات الأنتاجية للمواليد في الأرانب الهجينة التي نفذت في حقل الحيوانات التابعة لكلية العلوم الزراعية - جامعة السليمانية ، خلال فصل الربيع 2018 (من مارس إلى يوليو). و تم تربية (48) ثمانية وأربعون أناث و (24) أربعة وعشرون ذكر من الأرانب المحلية و المنتخب عشوائيا حسب التصميم الكامل ، والتي وزعت الى أربعة معاملات و بواقع (12 أناث / معاملة) و بثلاثة مكررات لكل معاملة ، والتي شملت تجربة المقارنة T1: بدون حقن ؛ المعاملات: T2 حقنت بمحلول فسلجي BPS ،T3: حقنت بـ eCG (10 IU) و T4: حقنت بـ(20 IU) eCG عن طريق الحقن العضلي قبل يومين من التلقيح ، و تم تربية كلا الجنسين في حضيرة شبه مغلق بنظام بطاريات للأرانب. جمعت البيانات المتعلقة بالمعاملات التي تمت دراستها على كل أرنب في كل مجموعة من حيث القدرة التناسلية و الصفات الإنتاجية للولادات المفطومة. أظهرت النتائج التي تم الحصول عليها الى قصر في طول فترة الحمل بصورة معنوية ($p\leq0.05$) عند أستخدام هرمون eCG (T3 و T4) بالمقارنة مع مجموعات المقارنة. و كانت معدل الولادات قد تفوقت معنوياً في المعاملة الأولى مقارنة بالمعاملات الأخرى ، و كانت عدد الولادات الحيوية في البطن الواحد في الأعمار 7 ، 21 و 28 يوم (عند الفطام) في المعاملة T4 قد تفوقت معنوياً على معاملة T1 و T2 . كذلك أختلفت معنوياً المعاملة T4 في الوزن الحي عند الأعمار 7 ، 21 يوم و عند الفطام. بينما تفوقت المعاملة T3 على المعاملة الكنترول في الوزن الحي للولادات في عمر 7 أيام (66.06 ± 3.46 غم / مولود) وكذلك تفوقت على معاملتي T1 و T2 في الأعمار 21يوم وعمر الفطام. نستنتج من الدراسة أن استخدام جرعة هرمون eCG في الأرانب الهجينة أدت إلى زيادة القدرة التكاثرية و الأداء إنتاجي للولادات خلال فترة الرضاعة وأثبتت أنه وسيلة فعالة لزيادة الإنتاج.