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EFFECTS OF HCG INJECTION AND BREED ON REPRODUCTIVE PERFORMANCE OF RABBITS, UNDER EGYPTIAN CONDITIONS

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SUMMARY: Forty five primiparous New Zealand White (NZW) and 30 primiparous Californian (CAL) doe rabbits were used to study the effect of injection of 50 IU. human chorionic gonadotrophin (HCG; Corulon) on reproductive and productive performance of NZW and CAL does and their offspring from parturition and to weaning. The effects of breed and parity were studied. Doe traits (conception rate, number of services per conception, gestation length, litter size, litter weight, litter weight gain and milk yield at 1st, 2nd and 4th week of lactation) and offspring traits (mean rabbit weight, daily weight gain and pre-weaning mortality percentage) were not significantly affected by breed and parity. However, the milk production during the 3rd week of lactation was higher for CAL does than for NZW does (P<0.01). Injection of 50 IU HCG significantly decreased (P<0.05) number of services per conception (1.38 *vs* 1.65), but increased litter size (7.6 *vs* 6.5 total born per litter), litter weight at 21 and 28 days of age, litter weight gain and daily weight gain from birth and up to 28 days of age compared to the saline injected does (control). However, conception rate, gestation length, litter weight at birth, milk yield at different stages of lactation, mean rabbit weight, daily weight gain from birth to 21 days of age and pre-weaning mortality percentages showed not significant differences.

RÉSUMÉ : Effets de l'injection d'HCG et de la race sur les performances de reproductions des lapins dans les conditions égyptiennes.

Quarante-cinq lapines primipares Néo-Zélandaises Blanches et 30 lapines primipares Californiennes ont été utilisées pour étudier l'effet de l'injection d'HCG sur les performances de reproduction et de production de ces lapines et de leur descendance de la naissance au sevrage. L'effet de la race et la parité ont été étudiés. Les caractéristiques des lapines (taux de fertilité, nombre de saillies par fécondation, durée de la gestation, taille de la portée, poids de la portée, gain de poids de la portée et production laitière aux 1ère, 2ème et 4ème semaine de lactation) et celles de leurs descendances (poids moyen des lapins, gain moyen journalier et % de mortalité avant sevrage) n'ont pas été significativement affectés par la race et la parité. Cependant la production laitière pendant la 3ème semaine de lactation a été plus élevée pour les lapines Californiennes que pour les Néo-Zélandaises Blanches (P<0,01). Comparée au lot témoin ayant reçu une injection saline, l'injection de 50 UI d'HCG diminue significativement (P<0,05) le nombre de saillies nécessaires par gestation augmente la taille de la portée (7,6 vs 6,5 nés totaux), le poids de la portée à 21 et 28 jours, le gain de poids de la portée et le gain de poids journalier de la naissance jusqu'à 28 jours. Cependant le taux de fécondation, la durée de la gestation, le poids de la portée à la naissance, la production laitière aux différents stades de la lactation, le poids moyen des lapins, le gain de poids journalier de la naissance jusqu'à 21 jours et le pourcentage de mortalité avant le sevrage n'ont pas montré de différences significatives.

INTRODUCTION

The New Zealand White (NZW) and Californian (CAL) breeds were introduce to Egypt as a commercial rabbit breeds for meat production. Reports from the literature (MEUNIER *et al.*, 1983; GABOR *et al.*, 1987; HULOT *et al.*, 1988; ARMERO *et al.*, 1991; CASTELLINI *et al.*, 1991 ; BOURDILLON *et al.*, 1992) indicated that the failure in ovulation after copulation is one of the major factors in the rabbit infertility. In the rabbit species, ovulation, which is induced by mating, occurs 10-13h after copulation. However, 20 to 25% of the does fail to ovulate even after copulation.

The objectives of the present study aimed to investigate the effects of injection with 50 I.U. HCG (Corulon) on doe and offspring traits of NZW and CAL rabbits. The effects of breed and parity were also studied.

MATERIAL AND METHODS

The experimental work of the present study was carried out at a Rabbit Farm located in the Nile Delta, Sharkia Province, Zagazig, Egypt. The experiment was led over 6 month reproduction period. The first mating took place in August, 1995 and the last weaning were achieved in January 1996.

The experimental rabbits were allotted in a windowed house naturally ventilated. Flat deck cages were provided with nests for does and automatic drinker nipples and galvanized feeders. All kindled kits were remained in the nests with their dams for suckling from birth up to weaning on 28 days. All rabbits were fed *ad libitum* a commercial pelleted ration containing 17.3% crude protein, 13.5% crude fibre and 3.2% fat. All rabbits were kept under the same managerial hygienic and environmental conditions. Maximum and minimum values of ambient temperature were 26.1 and 17.5°C and relative humidity were 93.9 and 65.5% in the rabbitry during the period of the study.

A total number of 45 primiparous NZW doe rabbits (aged 5-6 months with a mean live weight 3520±115 g) and 30 primiparous CAL doe rabbits (aged 5-6 months with a mean live weight 3350±139g) were used in the present study. Does in each breed with nearly equal body weights were divided randomly into two experimental groups. The first group was used as a control and each doe was injected intramuscularly just before mating with saline solution (1ml of 0.09% NaCl). The second group was injected intramuscularly just before mating with 50 I.U. HCG (Corulon, Intervet Italia, S. R. L. Milano). Fifteen (10 NZW and 5 CAL) fertile bucks (6-7 months of age) were used for mating. Mating was carried out at

Table 1. Effect of breeds, hormonal treatment and parity on conception rate, gestation length and litter size ($\bar{X} \pm SE$).

Classification	Nb of mated does	Nb of pregnant does	Conception rate (%)	Number of services per conception	Gestation length	Litter size at Birth Total	Litter size at Birth Alive	Litter size at 21 days	Litter size at 28 days
Breeds:			NS	NS	NS	NS	NS	NS	NS
New Zealand White	117	97	82.91	1.49±0.05	31.2±0.13	7.2±0.2	6.7±0.2	5.9±0.2	5.8±0.2
Californian	77	63	81.82	1.55±0.01	31.5±0.14	6.8±0.3	6.5±0.3	5.9±0.3	5.8±0.3
Hormonal treatment			NS	*	NS	*	*	**	**
Control	94	74	78.72	1.65^{a}±0.09	31.4±0.13	6.5^{b}±0.3	6.3^{b}±0.3	5.4^{b}±0.3	5.3^{b}±0.2
50 I.U. HCG	100	86	86.00	1.38^{b}±0.08	31.4±0.14	7.6^{a}±0.2	6.9^{a}±0.2	6.4^{a}±0.2	6.3^{a}±0.2
Parity:			NS	*	NS	NS	NS	NS	NS
1^{st} parity	75	64	85.33	1.66^{a}±0.10	31.5±0.10	6.7±0.3	6.5±0.3	6.0±0.3	5.9±0.3
2^{nd} parity	64	55	85.94	1.55^{a}±0.10	31.2±0.23	7.0±0.3	6.5±0.3	5.7±0.3	5.7±0.3
3^{rd} parity	55	41	74.55	1.29^{b}±0.07	31.1±0.16	7.5±0.3	6.9±0.3	5.9±0.3	5.8±0.3

Means in the same column within the same classification with different litter, differ significantly (P<0.05).
NS= Not significant * P<0.05 **P<0.01.

random between does and bucks in each breed and each doe was transported to the buck's cage to be mated and returned back to its cage after mating (semi-intensive system).

Number of does mated, number of pregnant does, parity of litter, conception rate (%), number of services per conception, gestation length (days), litter size, litter weight (g), mean kit weight (g), litter weight gain (g), daily weight gain (g), pre-weaning mortality rate (%) and milk production during the 1^{st}, 2^{nd}, 3^{rd} and the 4^{th} week of lactation were studied. Milk production was estimated by the method described by LUKEFAHR *et al.* (1983).

Data were statistically analysed with using factorial design (2x2x3) according to SNEDECOR and COCHRAN (1982). Duncan's New Multiple Range Test (1955) was used for the multiple comparisons. Conception rate was analysed using the Contingency Tables according to EVERITT (1977). Pre-weaning mortality percentages were subjected to arc-sin transformation before being analysed in order to approximate normal scale distribution. Means were transformed to the original scale before being illustrated.

RESULTS AND DISCUSSION

Doe traits:

Data in Tables 1 and 2 show that breed and parity had a non significant effects on doe traits (conception rate, number of services per conception, gestation length, litter size, litter weight, litter weight gain and milk yield at 1^{st}, 2^{nd} and 4^{th} week of lactation). These findings are in agreement with those obtained by EL-

Table 2. Effect of breeds, hormonal treatment and parity on litter weight, litter weight gain and milk yield ($\bar{X} \pm SE$).

Classification	Litter weight (g) at Birth	Litter weight (g) at 21 day	Litter weight (g) at 28 day	Litter weight gain (g) from Birth-21 days	Litter weight gain (g) from Birth-28 days	Litter weight gain (g) from 21-28 days	Milk yield (g) at 1st week	Milk yield (g) at 2nd week	Milk yield (g) at 3rd week	Milk yield (g) at 4th week
Breeds:	NS	NS	NS	NS	NS	NS	NS	NS	**	NS
N.Z.W.	359±12	1744±45	2427±65	1359±42	2046±62	683±37	652±25	878±38	1133^{b}±31	1020±38
Californian	346±14	1733±57	2383±89	1371±53	2041±81	667±49	617±36	882±32	1263^{a}±31	956±24
Hormonal treatment:	NS	*	**	*	**	**	NS	NS	NS	NS
Control	339±12	1649^{b}±53	2261^{b}±75	1299^{b}±47	1899^{b}±69	405^{b}±41	635±29	887±79	1186±32	982±27
50 I.U. HCG	370±13	1831^{a}±48	2560^{a}±70	1438^{a}±44	2191^{a}±66	750^{a}±40	635±34	874±32	1210±35	994±37
Parity:	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1^{st} parity	368±16	1700±56	2446±100	1310±47	2054±93	758±60	632±45	867±49	1176±40	1019±57
2^{nd} parity	344±13	1736±59	2388±85	1383±54	2029±79	646±43	585±39	865±36	1175±45	952±32
3^{rd} parity	448±18	1796±76	2401±85	1425±70	2051±80	614±42	687±24	909±75	1243±38	994±22

Means in the same column within the same classification with different litter, differ significantly (P<0.05).
NS= Not significant * P<0.05 **P<0.01.

Table 3. Effect of breeds, hormonal treatment and parity on offspring traits ($\bar{X} \pm SE$).

Classification	Mean rabbit weight (g) at			Daily weight gain (g) from		Pre-weaning mortality rate	
	Birth	21 days	28 days	Birth to 21 days	Birth to 28 days	Stillbirth	Birth to 28 days
Breeds:	NS	NS	NS	NS	NS	NS	NS
New Zealand White	55.9±1.16	306.6±6.4	428.0±7.8	12.00±0.31	13.37±0.25	4.08	13.50
Californian	57.2±1.44	317.8±11.1	441.0±12.1	12.42±0.49	13.78±0.41	6.11	9.34
Hormonal treatment:	NS	NS	NS	NS	*	NS	NS
Control	55.9±1.26	320.8±8.5	443.8±15.8	12.61±0.40	13.95^{a}±0.30	4.45	13.40
50 I.U. HCG	56.8±1.29	300.9±7.8	422.1±9.3	11.70±0.35	13.10^{b}±0.32	5.20	10.29
Parity:	NS	NS	NS	NS	NS	NS	NS
1st parity	58.8±1.61	300.2±10.6	422.8±12.2	11.50±0.48	13.17±0.38	2.81	12.64
2nd parity	55.3±1.45	319.2±9.8	422.1±11.5	12.69±0.45	13.84±0.39	2.67	8.98
3rd parity	54.6±1.53	313.9±9.0	434.2±10.0	12.31±0.43	13.58±0.35	6.81	14.66

Means in the same column within the same classification with different litter, differ significantly (P<0.05).
NS= Not significant * P<0.05 **P<0.01

MAGHAWRY *et al.* (1988) and EL-SAYIAD *et al.* (1993). However, the milk production during the 3rd week of lactation was higher for CAL does than for NZW does (P<0.01). The peak of milk yield was observed at the 3rd week. The amount of the live weight gain during the 3 first week could be considered as reflection of milk production because the kits depends upon the dam's milk until the 3rd week of lactation when they leave the nest box and being to consume solid feed (LANG 1981). Similar results were reported by EL-SAYIAD (1994). LUKEFAHR *et al.* (1983), RASHWAN and KAROLY (1989) and EL-SAYIAD *et al.* (1993) reported that NZW surpassed Californian does in milk yield during the 18 days lactation period.

Injection doe rabbits with 50 I.U. HCG significantly decreased (P<0.01 or 0.05) number of services per conception, but increased the litter size at birth, 21 and 28 days of age, litter weight at 21 and 28 days of age and litter weight gain from birth to 21 days, birth to 28 days and from 21 to 28 days of age compared to the saline injected does (control). However, conception rate, gestation length, litter weight at birth and milk yield at different stages of lactation showed not significant differences (Tables 1 and 2). These results are in agreement with those reported by ADAMS (1972), HULOT and POUJARDIEU (1976), URBANSKI (1979) and EL-GAAFARY *et al.* (1991). The improvement in reproductive performance of does injected with 50 I.U. HCG may be attributed to the LH-like effect of HCG.

Offspring traits:-

Results in Table 3 showed that the offspring traits (mean rabbit weight, daily weight gain and pre-weaning mortality percentages) were not significantly affected by breed and parity. Similar results were reported by RAHARJO *et al.* (1986), EL-MAGHAWRY *et al.* (1988) and EL-SAYIAD *et al.* (1993) for kit weight and viability and TAWFEEK and EL-HINDAWY (1991), YAMANI *et al.* (1991) and EL-SAYIAD *et al.* (1993) for daily body gain.

Mean rabbit weight at birth, 21 and 28 days of age, daily weight gain from birth to 21 days of age and pre-weaning mortality percentages at different ages studied were not significantly affected by hormonal treatment. However, the differences in daily weight gain from birth to 28 days of age were significantly (P<0.05) affected by hormonal treatment (Table 3). The average of daily weight gain between birth and weaning increased with the decrease of litter size at birth. Similar trend was obtained by AFIFI *et al.* (1973), EL-GAAFARY *et al.* (1991) and MARAI *et al.* (1994).

In conclusion, Californian doe rabbits surpassed NZW in milk yield at 21 days of lactation. However, the other traits of doe and offspring were not significantly affected by breed and parity. Doe rabbits injection with 50 I.U. HCG decreased number of services per conception and increased litter size, litter weight at 21 and 28 days of age and litter weight gain. Moreover, conception rate, litter weight at birth and milk yield at 21 days of lactation were enhanced too, as a result of HCG injection. Therefore, HCG injection with 50 I.U. could be used to improve the doe and offspring traits of NZW and CAL. rabbits, under Egyptian environmental conditions.

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