Effect of Development of Doe Weight During Pregnancy on Some Economic Traits in Bauscat, Californian and Baladi Red Rabbits

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***Received:** 13/6/2007*

Abstract: This study was carried out at the Experimental Rabbit Farm, Department of Animal Production, Faculty of Agriculture, Al-Azhar University, Nasr City Cairo, Egypt, during three Seasons of production starting in September 1991 till May 1992, to investigate some genetic and non-genetic effects on litter-traits, including litter size at birth (LSB), litter size born alive (LSBA), litter size at weaning (LSW), litter weight at birth (LWB), litter weight at weaning (LWW), litter weight gain (LWG) and daily litter weight gain (DLWG). Data was collected on 515 littres produced by 181 Bauscat (B), 180 Californian (CA) and 154 Baladi Red (BR) rabbits. Bauscat rabbits showed to some extent superiority over Californian and Baladi Red for some doe traits. Estimates of CV % of LSB, LSBA, LSW, LWB, LWW and LWG traits increased, in general, from birth to weaning. Season and Parity of kindling showed non-significant effect on most traits in the three breeds studied. Estimates of heritability for litter traits using Henderson method III in BR rabbits were low to extent higher than in B and CA rabbits for all traits studied, except LSB, LSBA and LWB estimates. Estimates of genetic correlation were positive in all breeds except (LWG) in Bauscat rabbit. Estimates of the regression of traits studied on (W.D.Con, W.D2w, W.D3w and W.D4w) were generally low and not show any consistent trend.

Keywords: rabbit. Litter size, litter weight, sires, heritability, regression.

INTRODUCTION

Genetic evaluation of rabbit doe productivity can be improved by the adjustment of (productivity for) the managerial and environmental influences (Khalil *et al.*, 1987). Preweaning litter size traits are probably the most important traits in reproductive performance of multiparous animals (El-Maghawry, 1997). The main objective of the investigation was to estimate litter size, weight and litter weight gain in three breeds of rabbits (Bauscat, California and Baladi Red which breed was introduced? It was aimed to estimate effects of non-genetic factors (i.e. Season and Parity of kindling). Heritability and genetic correlation were also studied.

MATERIALS AND METHODS

The experimental work of this study was carried out on the Experimental Rabbit Flock maintained by the Department of Animal Production, Faculty of Agriculture, Al-Azhar University in Nasr City, Cairo, Egypt. It lasted for nine months within one year of intensive production starting in (September 1991) till (May 1992). The period of the study was classified into three seasons being Autumn (September, October, November); winter (December, January, February) and spring (March, April, May). The data set included three commercial rabbit breeds: Bauscat (B), Californian (CAL) and Baladi Red (BR). The managerial processing, housing system and feeding ration were described by Attalah (1995).

Preweaning litter traits studied were litter size at birth (LSB), alive (LSBA), at weaning (LSW), litter weight at birth (LWB), at weaning (28 days, LWW), litter weight gain from birth to weaning (LWG) and daily litter weight gain (DLWG) also the partial regressions coefficients of these traits on weight of doe at conception, at 2, 3 and 4weeks of conception were calculated.

Data were analyzed separately for each breed (B, CA and BR) by using the mixed model (Model 2) Least-Squares and Maximum Likelihood Computer Program (Harvey, 1990).

Model of analysis:

Data of doe traits were analyzed for each breed separately using the following mixed models with the sire of doe as a random effect

$Y_{kmn} = \mu + S_k + Se_m + P_n + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + e_{kmn}$

Where:

Y_{kmn} =The observation on the kmnthdoe trait;

μ =Overall mean, common element to all observations;

S_k =A random effect of kth sire of doe;

Se_m =A fixed effect of the mth season of kindling;

P_n =A fixed effect of the nth parity;

b_1, b_2, b_3 and b_4 =the partial regressions coefficients of Y_{kmn} (dependent variable) on weight of doe at conception (x1), at 2 (x2), 3 (x3) and 4 (x4) weeks.

e_{kmn} = A random deviation of the pthdoe traits assumed to be independently randomly distributed, i.e. NID (0, σ^2e).

Paternal half-sib heritability estimates for the studied traits as well as genetic correlation coefficient between different litter traits were obtained (Harvey, 1990).

RESULTS AND DISCUSSION

Means: Number of records (No.), actual means and standard deviation (SD) for doe traits in Bauscat (B), Californian and Baladi Red (BR) rabbits are presented in Table 1. These means are within the ranges, reported in the Egyptian literature (Attalah, 1995; Ahmed, 1997; Afifi *et al.*, 2001; Youssef *et al.*, 2003; Farid *et al.*, 2004 and Gharib, 2004). However, data of actual means are reported herein for sake of comparisons with other research work.

Variations (CV %): Estimates of CV% for doe traits (Table 1) are generally within the ranges, reported in the Egyptian research. These moderate estimates of CV %

show that improving these traits through phenotypic selection is quite possible. Estimates of CV % of LSB, LSBA, LSW, LWB, LWW and LWG traits increased, in general, from birth to weaning which indicate their lower phenotypic variation at birth than at weaning (Ahmed, 1997; Abd El-Aziz, 1998; Gad, 1998; Haiam, 2003; Farid *et al.*, 2004 and Gharib, 2004). The higher CV % values observed at weaning than at birth are due to the discrepancy in mortality during the suckling period (Haiam, 2003). The increase of CV % for litter traits at weaning may be due to differences in post-natal growth of the litter, genetic differences and variation in milk production of their mothers during the suckling period (Afifi *et al.*, 1992)

Table (1): Actual means, standard deviations (SD) and coefficients of variation (CV %) for doe litter traits in Bauscat, Californian and Baladi Red rabbits.

Traits	Bauscat				Californian				Baladi Red			
	No	Means	SD	CV %	No	Means	SD	CV%	No	Means	SD	CV%
Litter size at birth	181	7.3	1.6	21.9	180	7.2	1.2	16.7	154	7.1	1.7	23.9
Litter size born alive	181	6.3	1.6	25.4	180	6.5	1.3	20.0	154	6.2	1.9	30.7
Litter size at weaning	181	5.1	1.6	31.4	180	4.9	1.4	28.6	154	4.0	1.7	42.5
Litter weight at birth	181	298.3	62.1	20.8	180	300.0	53.9	18.0	154	268.7	85.0	31.6
Litter weight at weaning	181	2077.1	544.9	26.2	180	2035.3	594.3	29.2	154	1603.8	690.1	43.0
litter weight gain	181	1778.9	524.9	29.5	180	1736.4	575.2	33.1	154	1336.6	637.5	47.7
Daily litter weight gain	181	59.0	19.2	32.5	180	62.0	20.5	33.1	154	47.8	22.8	47.7

Season of kindling: Results presented in Table (2) indicate that Season of kindling showed non-significant effect on almost all traits in the three breeds studied (Table 3), except LWW and LWG in (B) and LSB and LWB in (CA) which were significantly affected ($P\leq 0.05$ or $P\leq 0.01$). These results agree with those reported by Ahmed (1997), Afifi *et al.*, (2001), Abd El-Aziz *et al.*, (2002), Enab *et al.*, (2002) and Gharib (2004).

In the present study, litters born during Winter recorded the largest LSB, LSBA, heaviest LWG and DLWG in Bauscat rabbits, also litter born during Spring for Californian rabbits recorded the largest litter size and heaviest litter weight and litter weight gain. also litter born during winter in Baladi Red rabbits recorded the largest LSB, LSBA, LSW and heaviest LWB, while LWW, LWG and DLWG recorded the largest in Autumn.

Results in table 3&4 indicated that there were different trends for the effect of season of kindling on doe litter traits. The best mean estimates of traits were recorded, in general, during winter and autumn. These findings are comparable to those reported by Youssef (1992), Abd El-Raouf (1993), Nasr (1994), Farghaly and El-Darawany (1994), Khalil *et al.*, (1995), Farghaly (1996), Ahmed (1997) and Enab *et al.*, (2002) who observed general trend indicating that doe traits had a curvilinear relationship with season of kindling where, these traits seem to be low during autumn and increased during winter and spring and decreased again during summer. Seasonal variation on litter traits due to kindling season is reflection of differences in seasonal climatic conditions in geographical location of the rabbitry, (Youssef, 1992; Abdel-Raouf, 1993 and Farghaly, 1996). However, seasonal variability in doe traits could be a reflection to feed quality in variability and different climatic conditions among season (Abd El-Aziz, 1998).

Parity: Parity had non-significant effects (Table 2) on all traits in three breeds studied, except LSBA and LWB in Bauscat rabbits was effected significantly ($P\leq 0.05$ or $P\leq 0.01$). These results agree with most reviewed studies reported by Abd El-Aziz (1998), Nayera *et al.*, (1999), Saleh and Nofal (1999), Enab *et al.*, (2002), Abd El-Aziz (2002), and Farid *et al.*, (2004) and Gharib (2004).

On the other hand, Sedki (1991), Afifi *et al* (1992), Farghaly and El-Darawany (1994) and Farghaly (1996) observed that parity had significant ($P\leq 0.05$, $P\leq 0.01$ or $P\leq 0.001$). effect on doe traits.

Results in tables 3&4 revealed inconsistent trend for the effect of parity on doe traits. In this respect Abdel-Aziz (1998), Saleh and Nofal (1999), and Enab *et al.*, (2002), Farid *et al.*, (2004) and Gharib (2004) reported non definite trend for the effect of parity on doe litter traits. The differences in litter size and weight at birth due to parity effects may be attributed to changes in physiological efficiency of the doe taking place with advance of parity (Afifi and Khalil, 1989 and Afifi *et al.*, 1992). On the other hand, variation in litter traits from kindling up to weaning in different parities may be associated with the differences in doe's care and ability to suckle her young's till weaning (Afifi and khalil, 1989).

Heritability: Heritability estimates for litter traits in Bauscat, Californian and Baladi Red rabbits were shown in Table 5. Heritability estimates in BR rabbits were to some extent higher than those for B and CA rabbits for all traits studied, except LSB, LSBA and LWB estimates. However, these estimates were within ranges reported in the literature for litter traits (Afifi *et al.*, 1992; El-Zanfaly, 1996; Ahmed, 1997 and Haiam, 2003; Gharib 2004 and Mohammed, 2004).

In this respect, El-Zanfaly (1996) reported that most of the discrepancies between estimates of sire heritabilities, from different studies, may be attributed to the differences in breed groups of rabbits reared under particular environmental conditions during definite periods of time, size of data and variations in the statistical models or approaches adopted. Additionally, small sampling size per generation (Narayan, 1985) and non-randomness in the distribution of daughters within sire group (Khalil and Soliman, 1989) could also contribute to these discrepancies. In the present study the moderate estimates of heritability of most litter traits in CA and BR rabbits are sufficiently reasonable to indicate that direct selection for these traits would yield efficient and cost-effective genetic improvement. The reasonable precision of the estimates, as judged by their approximate standard errors, indicate that these estimates would be useful in designing selection programs. Some estimates of heritability gave zero or negative estimates for LAB and LABA which also been reported before for some doe traits by Garacia *et al.*, (1980), Randi Scossiroli (1980) and Narayan *et al.* (1985).

Genetic correlation (rG): Genetic correlation between litter traits for the three breeds studied showed that all of these relationships were positive except (LWG) in Bauscat rabbit (Table 6). Mostly genetic correlation estimates among litter traits were high and few of them were moderate. These results are in agreement with those of Afifi *et al* (1992), Farghaly and El-Darawany (1994); El-Maghawry (1997) and Farid *et al* (2004) with different breed groups. Estimates of genetic correlation in the present study, might suggest that breeder can select for litter size at earlier ages during the preweaning period. Selection for large litter size at birth might be associated with genetic improvement in the corresponding traits at weaning (El-Maghawry, 1997)

Regression coefficients: The linear regression coefficients of (W.D.Con) as covariant on litter traits studied (Table 2) were not significant in (B) and (CA) rabbits, also LSB and DLWG in (BR)rabbits, while were significant ($P \leq 0.01$or $P \leq 0.001$) in LSBA, LSW, LWB, LWW and LWG in Baladi Red rabbits. Regressions (W.D2w) in the three breeds on all traits were not significant except LWB which was significant ($P \leq 0.05$) in Baladi Red rabbits. Regression (W.D3w) in the three breeds on most traits were not significant except LWW and LWG in (B), LSB LSBA and LWB in (BR) was significant ($P \leq 0.05$, $P \leq 0.01$or $P \leq 0.001$). Regressions (W.D4w) in the three breeds on all traits were not significant except LWW and LWG was significant ($P \leq 0.05$) in Bauscat rabbits.

Estimates of the regression of traits studied on (W.D.Con, W.D2w, W.D3w and W.D4w) (Table 7) were generally low and did not show any consistent trend. Positive linear regression between (W.D.Con) LWB in (B), LSB, LSBA, LSW, LWW, LWG and DLWG in (CA); between (W.D2w) LSB, DLWG in (B); LWB, in (CA); on all trait except LSB in (BR); between (W.D3w) on all traits in (B), LWG and DLWG in (CA), on all traits in (BR); between (W.D4w) LSBA, LSW, LWB and LWW in (B); and on all traits in (CA), LWG in (BR).

Table (2): F-ratios of least squares analysis of variance for different factors affecting doe traits in Bauscat, Californian and Baladi Red rabbits.

	Source of variation	d.f	F-ratios						
			LSB	LSBA	LSW	LWB	LWW	LWG	DLWG
Bauscat	Sire of doe	25	1.15	0.78	1.38	1.60^{*}	1.06	1.16	1.05
	Season (SE)	2	0.10	1.60	0.74	2.81	3.68^{*}	3.60^{*}	2.37
	Parity (P)	3	1.48	2.70^{*}	2.05	4.65^{**}	0.13	0.14	2.59
	Regressions								
	W.D.con.	1	2.95	1.24	0.01	0.30	0.24	0.32	0.18
	W.D2w	1	0.07	0.07	1.04	0.77	0.76	0.67	0.04
	W.D3w	1	1.80	2.42	3.45	0.98	4.61	4.55^{*}	0.02
	W.D4w	1	0.74	0.16	0.23	0.32	3.70	4.24^{*}	1.10
	Remainder m.s	146	2.45	2.55	2.23	2828.87	283768.09	261884.28	312.36
Californian	Sire of doe	26	2.17^{**}	2.06^{**}	1.92^{**}	2.40^{***}	1.77^{**}	1.78^{**}	1.77^{**}
	Season (SE)	2	3.42^{*}	2.01	0.92	6.28^{**}	0.95	0.69	0.69
	Parity (P)	3	2.03	1.79	0.49	1.36	0.81	0.86	0.86
	Regressions								
	W.D.con.	1	2.84	0.57	2.78	0.36	1.18	1.35	1.31
	W.D2w	1	3.29	0.50	1.01	0.79	0.81	0.97	0.95
	W.D3w	1	0.95	1.56	0.35	1.65	0.001	0.01	0.004
	W.D4w	1	3.35	2.23	0.04	1.11	0.05	0.02	0.03
	Remainder m.s.	144	1.27	1.42	1.60	1653.08	295907.57	278762.66	355.88
Baladi Red	Sire of doe	20	0.96	1.39	2.04^{**}	1.89^{**}	1.81^{*}	1.83^{*}	1.83^{*}
	Season (SE)	2	1.36	2.63	0.05	0.99	1.64	2.06	2.05
	Parity (P)	3	1.16	0.23	0.60	0.46	2.02	2.36	2.34
	Regressions								
	W.D.con.	1	0.46	10.76^{***}	5.98^{**}	8.75^{**}	6.53^{**}	2.36^{**}	5.59
	W.D2w	1	1.22	2.39	3.01	3.76^{*}	3.07	2.72	2.69
	W.D3w	1	14.79^{***}	8.92^{**}	1.90	3.89^{*}	1.91	1.46	1.53
	W.D4w	1	0.31	0.01	0.08	0.03	0.000	0.00	0.00
	Remainder m.s.	124	2.58	2.91	2.37	5158.02	350328.85	301105.64	384.22

LSB=Litter size at birth, LSBA=Litter size born alive, LSW=Litter size at weaning, LWB=Litter weight at birth, LWW= Litter weight at weaning, LWG= Preweaning litter weight gain, DLWG= Daily litter weight gain.

* =P< 0.05 or ** = P< 0.01 or *** = P< 0.001, ^{ns} =Non- significant.

Table (3): Least-squares means and standard errors (S.E) for factors affecting Litter size traits in Bauscat, Californian and Baladi Red rabbits. (Model 2).

	Independent variable	No	LSB	LSBA	LSW
			Means ± S.E	Means ± S.E	Means ± S.E
Bauscat	**Overall mean**	181	7.3 ± 0.14	6.2 ± 0.13	5.1 ± 0.15
	Season				
	Autumn	71	7.3 ± 0.27	6.4 ± 2.70	5.4 ± 0.26
	Winter	73	7.4 ± 0.29	6.4 ± 0.29	5.0 ± 0.29
	Spring	37	7.1 ± 0.34	5.7 ± 0.34	5.0 ± 0.33
	Parity				
	1st	49	7.2 ± 0.31	6.7 ± 0.31	5.4 ± 0.30
	2nd	49	6.9 ± 0.26	5.7 ± 0.25	4.7 ± 0.25
	3rd	45	7.1 ± 0.36	6.1 ± 0.37	5.0 ± 0.36
	4th	38	7.4 ± 0.33	6.3 ± 0.33	5.4 ± 0.32
Californian	**Overall mean**	180	7.2 ± 0.15	6.6 ± 0.15	4.9 ± 0.15
	Season				
	Autumn	72	7.8 ± 0.28	7.0 ± 0.29	4.9 ± 0.31
	Winter	61	6.8 ± 0.24	6.3 ± 0.25	4.6 ± 0.26
	Spring	47	7.1 ± 0.31		
	Parity				
	1st	57	6.8 ± 0.27	6.1 ± 0.28	5.2 ± 0.29
	2nd	57	7.4 ± 0.20	6.8 ± 0.20	4.8 ± 0.21
	3rd	36	7.2 ± 0.25	6.6 ± 0.27	4.7 ± 0.28
	4th	30	7.5 ± 0.27	6.8 ± 0.29	4.8 ± 0.30
Baladi Red	**Overall mean**	154	7.1 ± 0.15	6.1 ± 0.22	4.0 ± 026
	Season				
	Autumn	29	6.9 ± 0.34	5.9 ± 0.40	4.1 ± 0.40
	Winter	69	7.4 ± 0.24	6.7 ± 0.29	4.0 ± 0.32
	Spring	56	6.9 ± 0.27	5.8 ± 0.33	4.0 ± 0.34
	Parity				
	1st	30	6.5 ± 0.34	6.0 ± 0.39	3.9 ± 0.39
	2nd	38	7.2 ± 0.32	6.1 ± 0.37	3.7 ± 0.38
	3rd	56	6.9 ± 0.24	6.0± 0.30	4.1 ± 0.32
	4th	30	7.5 ± 0.39	6.4± 0.44	4.4 ± 0.44

LSB= Litter size at birth, LSBA= Litter size born alive, LSW= Litter size at weaning.

Table (4): Least-squares means and standard errors (S.E) for factors affecting litter weight traits in Bauscat, California and Baladi Red rabbits (Model 2).

Breed	Independent variable	No	LWB	LWW	LWG	DLWG
			Means ± S.E	Means ± S.E	Means ± S.E	Means ± S.E
Bauscat	**Overall mean**	181	297.0 ± 5.93	2033.5 ± 44.89	1736.5 ± 45.87	57.8 ± 1.55
	Season					
	Autumn	71	315.5 ± 9.73	2161.1 ± 89.35	1845.6 ± 87.25	59.2 ± 3.10
	Winter	73	286.0 ± 10.61	2147.8 ± 98.87	1861.7 ± 96.26	63.5 ± 3.43
	Spring	37	289.6 ± 12.08	1791.7 ± 114.53	1502.1 ± 111.13	50.8 ± 3.97
	Parity					
	1st	49	322.3 ± 11.02	2018.9 ± 103.34	1696.6 ± 100.49	61.7 ± 3.58
	2nd	49	279.7 ± 9.41	2011.1 ± 85.84	1731.4 ± 83.93	52.2 ± 2.98
	3rd	45	283.3 ± 12.89	2012.6 ± 123.08	1729.3 ± 119.27	55.0 ± 4.27
	4th	38	302.8 ± 11.65	2091.4 ± 110.04	1788.6 ± 106.86	62.4 ± 3.82
Californian	**Overall mean**	180	301.7 ± 5.66	2021.8 ± 63.19	1721.3 ± 61.56	61.5 ± 2.19
	Season					
	Autumn	72	319.8 ± 10.17	2055.1 ± 129.50	1734.8 ± 125.80	62.0 ± 4.49
	Winter	61	276.9 ± 8.80	1885.2 ± 110.13	1610.6 ± 107.03	57.5 ± 3.82
	Spring	47	308.3 ± 11.50	2125.1 ± 148.07	1818.3 ± 143.81	64.9 ± 5.14
	Parity					
	1st	57	285.6 ± 9.83	2087.6 ± 124.67	1803.5 ± 121.12	64.4 ± 4.32
	2nd	57	301.9 ± 7.31	2112.7 ± 88.45	1810.8 ± 86.01	64.7 ± 3.07
	3rd	36	304.7 ± 9.33	1903.1 ± 117.63	1602.6 ± 114.30	57.3 ± 4.08
	4th	30	314.5 ± 10.09	1983.7 ± 128.43	1668.1 ± 124.77	59.6 ± 4.46
Baladi Red	**Overall mean**	154	268.1 ± 11.62	1637.1 ± 92.81	1369.2 ± 86.85	48.9 ± 3.1
	Season					
	Autumn	29	261.2 ± 18.16	1812.2 ± 147.76	1548.7 ± 137.50	55.3 ± 4.91
	Winter	69	282.7 ± 14.28	1536.9 ± 115.30	1256.3 ± 107.55	44.9 ± 3.84
	Spring	56	259.8 ± 15.52	1562.3 ± 125.71	1302.6 ± 117.15	46.6 ± 4.18
	Parity					
	1st	30	267.1 ± 1796	1534.0 ± 146.14	1269.0 ± 136.01	45.3 ± 4.86
	2nd	38	267.3 ± 17.24	1434.8 ± 140.07	1167.5 ± 130.40	41.8 ± 4.65
	3rd	56	257.8 ± 14.37	1734.0 ± 116.66	1479.4 ± 108.25	52.9 ± 3.86
	4th	30	280.5 ± 20.04	1845.6 ± 163.43	1560.9 ± 15.20	55.8 ± 5.43

LWB = litter weight at birth, LWW = litter weight at weaning, LWG = preweaning litter weight gain and DLWG= Daily litter weight gain

Table (5): Estimates of heritability (h_s^2) and their standard errors (SE) for doe traits in Bauscat (B), Californian and Baladi Red (BR) rabbits

Traits	Bauscat		Californian		Baladi Red	
	No	h_s^2 ± S.E	No	h_s^2 ± S.E	No	h_s^2 ± S.E
LSB	181	0.09 ± 0.21	180	0.65 ± 0.30	154	a
LSBA	181	a	180	0.60 ± 0.30	154	0.24 ± 0.26
LSW	181	0.23 ± 0.23	180	0.53 ± 0.28	154	0.59 ± 0.31
LWB	181	0.35 ± 0.25	180	0.76 ± 0.31	154	0.51 ± 0.30
LWW	181	0.40 ± 0.20	180	0.45 ± 0.27	154	0.47 ± 0.30
LWG	181	0.10 ± 0.21	180	0.46 ± 0.27	154	0.48 ± 0.30
DLWG	181	0.03 ± 0.20	180	0.45 ± 0.27	154	1.00 ± 0.00

LSB= Litter size at birth, LSBA= Litter size born alive, LSW= Litter size at weaning, LWB= litter weight at birth, LWW = litter weight at weaning, LWG = pre weaning litter weight and DLWG= Daily litter weight gain,
a= negative estimates were set to zero.

Table (6): Estimates of genetic correlation coefficient for doe litter traits in Bauscat, Californian and Baladi Red rabbits.

Traits	Bauscat	Californian	Baladi Red
LSB x LSBA	a	0.93± 0.84	a†
LSB x LSW	0.23 ± 0.23	0.87 ± 0.14	a
LSB x LWB	a	0.98 ± 0.18	a
LSB x LWW	a	0.49 ± 0.32	a
LSB x LWG	a	0.40 ± 0.35	a
LSB x DLWG	a	0.40 ± 0.35	a
LSBA x LSW	a	0.87 ± 0.14	0.61 ± 0.35
LSBA x LWB	a	a	0.78 ± 0.24
LSBA x LWW	a	0.67 ± 0.26	0.25 ± 0.59
LSBA x LWG	a	0.58± 0.30	0.15 ± 0.63
LSBA x DLWG	a	0.58± 0.30	0.15 ± 0.63
LSW x LWB	a	0.67 ± 0.26	0.76 ± 0.20
LSW x LWW	a	0.93 ± 0.09	0.86 ± 0.12
LSW x LWG	- 0.92 ± 0.54	0.88 ± 0.36	0.81 ± 0.16
LSW x DLWG	a	0.20 ± 0.38	0.81 ± 0.16
LWB x LWW	a	0.30± 0.36	0.44 ± 0.38
LWB x LWG	a	0.20 ± 0.38	0.34 ± 0.43
LWB x DLWG	a	0.20 ± 0.38	0.34 ± 0.43
LWW x LWG	a	1.00 ± 0.00	0.99 ± 0.01
LWW x DLWG	a	1.00 ± 0.00	0.99 ± 0.01
LWG x DLWG	a	1.00 ± 0.00	1.00 ± 0.00

LSB= Litter size at birth, LSBA= Litter size born alive, LSW= Litter size at weaning, LWB = litter weight at birth, LWW = litter weight at weaning, LWG = pre weaning litter weight gain and DLWG= Daily litter weight gain,
† a = genetic correlations coefficients not estimated.

Table (7): Estimates of linear regression analysis for doe litter traits Bauscat, Californian and Baladi Red rabbits. (Model 2)

	No	LAB	LSBA	LSW	LWB	LWW	LWG	DLWG
Bauscat								
Regressions on								
W.D.con.	181	-0.03±0.06	-0.02±0.02	-0.03±0.06	0.29±0.52	-2.58±5.24	-2.87±5.03	-0.08±0.18
W.D2w	181	0.01±0.03	-0.01±0.03	-0.02±0.02	-0.76±0.86	-7.55±8.66	-6.79±8.31	0.06±0.30
W.D3w	181	0.02±0.01	0.02±0.01	0.03±0.01	0.50±0.50	10.79±5.03	10.30±4.83	0.02±0.17
W.D4w	181	- 0.001±0.001	0.004±0.001	0.001±0.001	0.02±0.04	-0.75±0.39	-0.77±0.37	-0.01±0.01
Californian								
Regressions on								
W.D.con.	180	0.03±0.01	0.01±0.01	0.02±0.01	-0.18±0.30	4.35±4.00	.4.51±3.89	0.16±0.14
W.D2w	180	-0.02±0.01	-0.01±0.02	-0.01±0.01	0.33±0.37	-4.45±4.95	-4.73±4.80	0.17±0.17
W.D3w	180	-0.01±0.01	-0.01±0.01	-0.004±0.01	0.30±0.23	-0.05±3.08	0.23±2.99	0.01±0.11
W.D4w	180	0.01±0.01	0.01±0.01	0.001±0.01	0.22±0.21	0.63±2.81	0.41±2.72	0.02±0.10
Baladi Red								
Regressions on								
W.D.con.	154	-0.01±0.01	-0.04±0.01	-002±0.01	-1.36±0.46	-9.72±3.80	8.35±0.53	-0.30±0.13
W.D2w	154	-0.01±0.01	0.02±0.01	0.02±0.01	0.95±0.49	7.10±4.05	6.20±3.76	0.22±0.13
W.D3w	154	0.02±0.01	0.02±0.01	0.02±0.01	0.49±0.29	2.84±2.06	2.31±1.91	0.08±0.07
W.D4w	154	-0.002±0.003	-0.004±.004	-0.001±.003	-0.03±0.17	-.001±1.41	0.02±1.31	-0.003±0.05

W.D.Con= weight of doe at conception, W.D2w= weight of doe at 2 weeks at conception, W.D3w= weight of doe at 3 weeks at conception and W.D4w =weight of doe at 4 weeks at conception.

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تطور وزن الأم أثناء الحمل وتأثيره على بعض الصفات الاقتصادية للأم فى أرانب البوسكات والكاليفورنيا و البلدي الأحمر

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أجريت هذه الدراسة على ٥١٥ بطن منها ١٨١ بطن من أرانب البوسكات و ١٨٠ بطن من أرانب الكاليفورنيا و ١٥٤ بطن من أرانب البلدي الأحمر في مزرعة الأرانب البحثية بكلية الزراعة- جامعة الأزهر بمدينة نصر- مصر خلال ثلاثة مواسم متتالية بدأت في سبتمبر ١٩٩١ حتى مايو ١٩٩٢ وذلك لدراسة بعض التأثيرات الوراثية و الغير وراثية على صفات الأمهات فى الأرانب:

و يمكن تلخيص نتائج هذه الدراسة كما يلي:

- أرانب البوسكات أظهرت تفوقا نسبيا في معظم صفات أنثى الأرانب المدروسة.
- تقديرات معاملات الاختلاف لصفات حجم ووزن البطن عند الفطام كانت أكبر منها عند الميلاد في كل السلالات.
- كان تأثير فصل الميلاد و ترتيب البطن غير معنوي علي معظم الصفات محل الدراسة في كل السلالات.

كانت تقديرات المكافئ الوراثي لمعظم صفات أنثى الأرانب محل الدراسة المقدرة بطريقة هند رسون(٣) في أرانب البلدى الأحمر أعلى من كل منها فى أرانب البوسكات أو الكاليفورنيا، وقد تراوحت القيم بين المنخفضة إلى المتوسطة.

- كانت قيم الارتباط الوراثي بين الصفات موجبة فى اغلب الحالات.
- كان لتأثير وزن الأم عند التلقيح والإخصاب وكذالك وزن الأم فى الأسبوع الثانى، الثالث و الرابع من الإخصاب فى معظم الصفات غير معنوي وكانت القيم منخفضة ولم يكن هناك اتجاه محدد لتلك الأوزان على الصفات محل الدراسة في كل السلالات.