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FACTORS AFFECTING WEANING AND POST-WEANING BODY MEASUREMENTS IN BAUSCAT AND BALADI RED RABBITS

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ABSTRACT: A total of 726 weaned Bauscat (B) and 485 Baladi Red (BR) rabbits were used to evaluate their weaning and post-weaning body measurements (Body length, BL; Loin length, LL; Chest circumference, CC; chest width, CW and loin width, LW) from weaning (4 weeks) up to marketing age (14 weeks). This study was carried out at the Experimental Rabbit Farm, Department of Animal Production, Faculty of Agriculture, Al-Azhar University, Nasr City Cairo, Egypt, for three consecutive years of production starting September 1998.

Performance of Bauscat was superior to Baladi Red for most traits studied. Year of birth effect on body measurements (cm.) was significant ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$) at 4 and 14 weeks for BL; at 4 weeks for CC and at 14 weeks for CW in B rabbits, while at 4 and 14 weeks for BL; at 4, 8 and 14 weeks for CC; at 4, 8 and 12 weeks for CW and at 14 weeks for LW in BR rabbits. Season of birth had generally a significant ($P \leq 0.01$or $P \leq 0.001$) effect on body measurements (at 14 weeks for BL; at 8, 12 and 14 weeks for LL; at 8, 12 and 14 weeks for CC; at 4, 8, 12 and 14 weeks for WC and at 4, 8, 12 and 14 weeks for WL in B rabbits and at 4 and 8 weeks for BL, at 12 weeks for LL, at 4, 8 and 12 weeks for CC, at 4, 8, 12 and 14 weeks for WC and 4, 8 and 14 weeks for WL in BR. Body measurements were found to differ non-significantly with parity in most traits at most ages with no clear trend. Sex effects on BM of the two studied breeds were not significant at all ages studied. sire effect was significant ($P \leq 0.05$, $P \leq 0.01$or $P \leq 0.001$) at 4 and 14 weeks for BL, at 4 and 12 weeks for LL, at 4 weeks for CC, at 4, 8 and 14 for CW in B rabbits, at 4, 12 and 14 weeks for BL, at 4 and 12 weeks for LL, at 4, 8 12 and 14 weeks for CC, at 4, 12 and 14 weeks for CW and at 8, 12 and 14 weeks for WL in BR rabbits. Variance components due to sire effect were found to be higher for most traits studied in BR than in B rabbits.

Estimates of heritability in Baladi Red rabbits are higher than those in Bauscat rabbits. The linear regression coefficients of body weight (BW) as covariant on body measurements studied were significant ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$) at 4, 12 and 14 weeks for BL; at 8 and 12 weeks for LL; at 4 and 14 weeks for CC; at 4 weeks for WC and at 4, 8, 12 and 14 weeks for WL in B rabbits and at 8 and 14 weeks for BL; at 14 weeks for LL; at 8 and 14 weeks for CC and at 8 and 14 weeks for CW in BR rabbits. The effect of litter size at birth (LSB) was non-significant except at 8 weeks for LL ; at 12 weeks for CC and at 14 weeks for WL in B; at 8 weeks for CC and at 8 and 12 weeks for CW in BR t ($P<0.05$, $P<0.01$or $P<0.001$).

INTRODUCTION

In developing countries, where the human population is still growing, land that was traditionally used for large animal production is giving way to enlarging communities. According to Vietmeyer (1985), "livestock for use in developing countries should, like computers, be getting smaller and become personal", production of animals becomes more intense with increased need of a protein source. This is where the prolific rabbit is finding increasing importance as a protein source (Cheeke, 1986; Khalil et al, 1986).

Live animal body length (from the atlas vertebra to the 7^{th} lumber vertebra, i.e. dorsal length as cited by Ouhayon and Blasco ,1992) whereas, in farm animal meat would be deposited dorsal bonds. Chest circumference measure could play a role in the rabbit overall tidal air during breathing which turn to affect its healthiness; fitness; vigor and strength. Ayyat et al. (1995) reported that live body weight and thigh length index may be used for classification of rabbit for production to different grades both of marketing and breeding . The importance of these traits is easily recognized but no data were available in the literature on development of body measurements in rabbits (Bersenyi et al, 1998). Therefore, these traits may have a role in classic breeding programs (Abdel-Ghany et al,2001 and Hassan et al, 2001).

The objective of the present study was to quantify effect of some non-genetic (year and season of birth, parity, sex, Litter size at birth) and the genetic factors (sire) on weaning and post-weaning body measurements in Bauscat and Baladi Red rabbits. Also , evaluation the relationship effect of body weight and litter size at birth on body measurements.

MATERIALS AND METHODS

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 during three consecutive years of production starting September1998 till October 2001. Local Egyptian breed of rabbits (Baladi Red, BR) and the exotic breed (Bauscat, B) were used. Does and bucks of the exotic breed used were descendents of the (Bauscat, B) rabbits raised under the Egyptian condition. According to the breeding plan, bucks were assigned at random to breed the does with a restriction to avoid full-sib, half-sib and parent offspring mating. The managerial processing, housing system and ration feeding were described by Farid et al, 2006.

Mixed Model Least Squares and Maximum Likelihood Computer Program PC version 2 (Harvey, 1990) was used for analyzing the data. In this study, effect of some non-genetic (year and season of birth, parity, sex and litter size at birth) and genetic factor (sire) on some body measurements, BM (Body length, BL; Loin length, LL: Chest circumference, CC; chest width, CW and loin width, LW) from weaning age (4 weeks), at 8, 12 and 14 weeks were investigated.

Data and models of analysis:

Data of body measurements (BM) were analyzed for each breed separately using the following mixed model:

$$Y_{klmnpq} = \mu + S_k + Y_l + Se_m + P_n + Cx_p + b1x1 + b2x2 + e_{klmnpq}$$

Where:

μ = overall mean, common element to observations;
S_k = random effect of k^{th} sire;
Y_l = fixed effect of the l^{th} year of kindling;
Se_m = fixed effect of the m^{th} season of kindling;
P_n = fixed effect of the n^{th} parity;
Cx_p = fixed effect of the p^{th} sex;

b1= the partial regressions coefficients of $Y_{klmnopq}$ (dependent variable) on age-respective body weight of progeny (x1).

b2 = the partial regressions coefficients of $Y_{klmnopq}$ (dependent variable) on litter size at birth (x2),

$e_{klmnopq}$ = random deviation of the q^{th} individuals body measurements traits assumed to be independently randomly distributed, i.e. N.D $(0, \sigma^2 e)$.

Heritability estimates of body measurements traits (BM) were computed for each breed separately using paternal half-sib relationship, as four times the intra-class correlation coefficient between sire groups (Harvey, 1990).

$$h^2_s = 4\,\sigma^2 s \,/\, (\sigma^2 s + \sigma^2 e)$$

The standard errors of heritability estimates were calculated according to Swiger et al. (1964) and Harvey, (1990) as follow:

$$S.E.\,(h^2_s) = 4\,\{[2(n.-1)(1-t)^2[1+(k-1)t]^2\}/\{k^2(n.-s)(s-1)]\}^{0.5}$$

Where:

n. = total number of observations.
t = interaclass correlation.
k = value sire weighing factor.
s = number of sires.

RESULTS AND DISCUSSION

Number of observation, means, standard deviations (SD), and coefficients of variations (CV%) of individual body measurements (body length, BL; loin length, LL; chest circumference, CC; chest width, CW and loin width, LW) from Weaning till 14 weeks of age for Bauscat and Baladi Red rabbits are given in (Table 1). Actual means of B rabbits were higher than those of BR rabbits reported by Abdel-Ghany et al, (2001) and Hassan et al, (2001) with NZW, BB, and BR rabbits.

Estimates of coefficient of variations (CV%) ranged from 3.1- 9.7, from 6.7-18.3, from 6.9-10.6, from 8.6-17.1 and from 9.1-13.6 for BL, LL, CC, CW and LW, respectively, for B rabbit; ranged from 5.6-9.4, 7.0 – 44.5, 4.0- 10.5, 4.6-16.2 and 7.4-16.2 for BL, LL, CC, CW and LW, respectively, for BR rabbit. These estimates be within the ranges, reported by Abdel-Ghany et al, (2001) and Hassan et al, (2001). The results showed a general trend indicating that percentages of variation of a certain breed group of rabbits decreased with advance of age. Results of Abdel-Ghany et al, (2001) and Hassan et al, (2001) indicated that BL and CC at weaning had higher phenotypic variations than at 12 weeks of age. However, the higher CV% for body measurements at weaning than those at marketing (14 weeks) could probably be due to that these traits would become less sensitive to non-genetic factors especially those associated with maternal effects, which in general, diminishes with advance of progeny age. Also, it might be due to the consequence of the combination of non-genetic maternal environment and genetic factors (Falconer, 1989).

Table1. Actual means, standard deviations (SD) as well as coefficients variation (CV%) of body measurements in Bauscat and Baladi Red rabbits.

Traits	Bauscat			Baladi Red		
	No	Means ± S.D.	CV %	No	Means ± S.D.	CV %
body length at						
4 Weeks	726	16.8 ± 1.7	9.7	485	16.8 ± 1.6	9.4
8Weeks	595	23.3 ± 2.0	8.4	400	23.1 ± 2.0	8.7
12 Weeks	508	27.8 ± 1.4	4.8	346	27.0 ± 1.6	5.6
14 Weeks	506	31.3 ± 1.0	3.1	330	30.6 ± 2.0	6.5
Loin length at						
4 Weeks	726	5.7 ± 0.9	16.3	485	5.5 ± 1.0	17.3
8Weeks	595	8.3± 1.6	18.3	400	8.4 ± 3.7	44.5
12 Weeks	508	9.8 ± 1.4	4.8	346	9.6 ± 1.2	13.0
14 Weeks	506	11.4 ± 0.9	7.9	330	11.3 ± 0.8	7.0
Chest circumference at						
4 Weeks	726	14.4 ± 1.6	10.6	485	14.6 ± 1.5	10.2
8Weeks	595	19.3 ± 1.9	9.1	400	19.4 ± 1.7	8.5
12 Weeks	508	22.7 ± 1.6	6.9	346	22.6 ± 1.4	8.1
14 Weeks	506	24.6 ± 1.7	4.9	330	24.4 ± 1.1	4.0
Chest width at						
4 Weeks	726	5.0 ± 1.1	17.1	485	4.9 ± 1.0	16.2
8Weeks	595	9.2 ± 1.7	15.1	400	9.4 ± 1.5	4.6
12 Weeks	508	11.9 ± 1.3	4.8	346	11.0 ± 1.8	15.3
14 Weeks	506	13.3 ± 1.2	8.5	330	12.7 ± 1.3	9.7
Loin width						
4 Weeks	726	3.7 ± 0.6	13.6	485	3.6 ± 0.5	13.2
8Weeks	595	5.4 ± 0.7	10.9	400	5.1 ± 0.8	16.2
12 Weeks	508	6.2 ± 0.7	10.0	346	6.0 ± 0.5	9.8
14 Weeks	506	7.2 ± 0.7	9.1	330	6.8 ± 0.6	7.4

Non-genetic effects:

Year of birth:

Year of birth effect on body measurements was found to be significant ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$) at 4 and 14 weeks for BL, at 4 weeks for CC and at 14 weeks for CW in B rabbits, while at 4 and 14 weeks for BL, at 4, 8 and 14 weeks for CC, at 4, 8 and 12 weeks for CW and at 14 weeks for LW in BR rabbits (Tables 2, 3 and 4). Similar results were also, reported by Hassan (1988) with NZW, BB and BR rabbits.

Table 2. F-ratios of least-squares analysis of variance for body measurements (body length and loin length) at different ages studied in Bauscat and Baladi Red rabbits.

Source of variation		body length at				Loin length at			
	d.f	4w	8w	12w	14w	4w	8w	12w	14w
Bauscat									
Sire	14	1.82*	0.94	0.94	1.81*	2.03**	0.85	1.73*	0.68
Year of birth (YB)	2	6.38**	2.16	0.80	2.33*	2.83	0.85	0.49	0.22
Season of birth (SE)	3	1.72	2.34	6.80***	1.80	0.90	12.84***	4.41**	7.11
Parity (P)	5	1.82	3.18**	1.45	2.33*	0.76	0.86	1.14	1.86
Sex	1	7.19**	0.36	1.57	4.06*	2.65	0.46	0.02	0.25
Regressions									
Body weight	1	13.00***	0.18	11.52***	53.92***	0.33	0.46*	9.62**	12.29***
LSB	1	0.12	0.44	0.44	2.23	0.16	0.73**	1.60	0.05
Remainder. d.f		698	467	480	478	698	467	480	478
Remainder mean squares.		2.64	3.85	1.79	0.92	0.85	2.30	1.81	0.80
Baladi Red									
Sire	13	1.80*	1.05	1.91*	1.10	1.82*	1.50	1.93*	1.28
Year of birth (YB)	2	3.00*	0.12	2.42	5.34**	0.50	0.44	2.64	1.56
Season of birth (SE)	3	3.64*	2.79*	0.04	0.56	2.08	1.20	11.67***	0.60
Parity (P)	5	1.65	0.68	0.23	0.67	1.01	0.91	1.24	0.79
Sex	1	0.07	3.35	1.66	2.48	3.98*	0.66	1.85	0.01
Regressions									
Body weight	1	1.74	3.58*	5.91	9.66**	0.08	0.99	0.07	8.71*
LSB	1	0.76	1.08	0.20	0.19	0.02	0.43	1.68	1.71
Remainder. d.f		458	373	319	300	458	373	319	300
Remainder mean squares.		2.31	4.02	2.33	4.00	0.91	13.89	1.25	0.63

*= significant at P≤ 0.05or **= significant at P≤ 0.01or ***= significant at P≤ 0.001.

Table 3: F-ratios of least-squares analysis of variance for body measurements (chest circumference and Chest width) at different ages studied in Bauscat and Baladi Red rabbits

Source of variation		Chest circumference				Chest width			
	d.f	4w	8w	12w	14w	4w	8w	12w	14w
Bauscat									
Sire	14	1.80*	1.47	١,٥٤	1.05	3.4***	1.86*	1.61	1.91*
Year of birth (YB)	2	7.07**	2.43	1.37	0.17	2.17	1.45	1.12	9.22***
Season of birth (SE)	3	2.17	10.43***	7.07***	3.47*	88.19***	49.01***	26.55***	5.34***
Parity (P)	5	1.70	1.92	0.90	1.76	1.53	1.69	2.10	2.68*
Sex	1	9.81**	0.26	0.002	2.21	0.61	0.58	2.42	0.90
Regressions									
Body weight	1	12.77***	0.56	3.51	4.68*	10.41***	0.13*	3.33	0.74
Litter size at birth	1	0.55	0.64	11.04***	0.41	1.30	0.86	3.51	2.76
Remainder. d.f		698	467	480	478	698	467	480	478
Remainder mean squares.		2.45	3.10	2.43	2.70	0.74	1.92	1.31	1.30
Baladi Red									
Sire	13	1.75*	2.24**	2.54**	3.00***	4.84***	1.59	2.98***	1.90*
Year of birth (YB)	2	3.50*	5.60**	0.22	4.12*	4.23**	3.80*	4.27**	1.29
Season of birth (SE)	3	3.35	4.46**	2.60*	1.47	10.45***	15.08***	11.0***	5.93***
Parity (P)	5	0.85	2.15	3.99***	1.00	7.23***	5.95***	0.41	0.19
Sex	1	0.51	1.18	0.30	0.14	0.0004	3.50	0.33	0.001
Regressions									
Body weight	1	2.56	6.95**	0.06	5.13*	1.90	9.19**	0.38	6.08**
Litter size at birth	1	1.11	4.58*	0.16	2.26	0.69	4.55*	9.25**	0.25
Remainder. d.f		458	373	319	300	458	373	319	300
Remainder mean squares.		2.2	1.85	1.77	0.97	0.63	1.85	2.41	1.5

*= significant at $P \leq 0.05$or **= significant at $P \leq 0.01$or ***= significant at $P \leq 0.001$.

Least squares means listed in (Tables 5, 6, 7, 8 and 9) show that there was an inconsistent trend for the effect of year of birth on body measurements at different ages studied in both breeds. Similarly, (Hassan, 1988; Abdel-Ghany et al, 2001 and Hassan et al, 2001) with different breeds of rabbits.

Table 4 : F-ratios of least-squares analysis of variance for body measurements (body length) at different ages studied in Bauscat and Baladi Red rabbits

Source of variation		body length at			
	d.f	4w	8w	12w	14w
Bauscat					
Sire	14	1.38	1.98	1.30	1.28
Year of birth (YB)	2	2.07	2.75	1.27	2.16
Season of birth (SE)	3	37.94***	61.67***	24.95***	4.02**
Parity (P)	5	2.43*	1.74	0.33	1.45
Sex	1	4.69*	1.72	1.71	0.85
Regressions					
Body weight	1	12.41***	5.97**	3.33	15.48***
Litter size at birth	1	1.26	0.97	0.01	5.68*
Remainder. d.f		698	467	480	478
Remainder mean squares.		0.25	0.35	0.38	0.43
Baladi Red					
Sire	13	1.24	2.48**	4.16***	1.60
Year of birth (YB)	2	0.47	0.11	0.92	5.30**
Season of birth (SE)	3	4.04**	10.58***	0.60	11.43***
Parity (P)	5	1.19	1.75	4.24***	1.36
Sex	1	1.78	0.59	0.39	0.01
Regressions					
Body weight	1	0.02	2.95	3.31	1.24
Litter size at birth	1	1.92	1.54	0.29	1.36
Remainder. d.f		458	373	319	300
Remainder mean squares.		0.41	0.67	0.23	0.25

*= significant at $P \leq 0.05$or **= significant at $P \leq 0.01$or ***= significant at $P \leq 0.001$

Season of birth:

Results presented in (Table 2, 3 and 4), revealed that season of birth had generally a significant ($P \leq 0.01$or $P \leq 0.001$) effect on body measurements of rabbits at 14 weeks for BL; at 8, 12 and 14 weeks for LL; at 8, 12 and 14 weeks for CC; at 4, 8, 12 and 14 weeks for CW and at 4, 8, 12 and 14 weeks for LW in B rabbits and at 4 and 8 weeks for BL; at 12 weeks for LL; at 4, 8 and 12 weeks for CC; at 4, 8, 12 and 14 weeks for CW and 4, 8 and 14 weeks for LW in BR rabbits. These results, are in agreement with those of Hassan (1988), Abdel-Ghany et al (2001) and Hassan et al (2001) who concluded that the effect of month of birth on most body measurements were significant at most ages studied.

Table 5: Least-squares means and standard errors (S.E) for factors affecting body measurements(Body length) in Bauscat and Baladi Red rabbits.

Independent variable	Body length at							
	4 weeks		8 weeks		12 weeks		14 weeks	
Bauscat	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E
Overall mean	726	16.8 ± 0.12	595	23.4 ± 0.09	508	27.7 ± 0.07	500	31.3 ± 0.08
Year of birth								
1st	244	16.1 ± 0.23	170	23.2 ± 0.29	148	27.5 ± 0.21	143	31.3 ± 0.16
2nd	199	17.0 ± 0.17	167	23.7 ± 0.19	150	27.9 ± 0.14	149	31.1 ± 0.12
3rd	283	17.3 ± 0.20	258	23.2 ± 0.23	210	27.9 ± 0.17	208	31.5 ± 0.14
Season of birth								
Autumn	124	17.0 ± 0.21	87	23.2 ± 0.25	71	28.2 ± 0.19	69	31.2 ± 0.16
Winter	205	16.6 ± 0.16	161	23.3 ± 0.17	128	27.6 ± 0.13	124	31.4 ± 0.12
Spring	263	16.8 ± 0.15	225	23.2 ± 0.16	198	28.0 ± 0.12	198	31.4 ± 0.11
Summer	134	16.9 ± 0.20	122	23.9 ± 0.22	111	27.3 ± 0.16	109	31.1 ± 0.14
Parity								
1st	111	16.9 ± 0.21	79	23.0 ± 0.27	63	27.5 ± 0.20	61	31.4 ± 0.16
2nd	159	16.7 ± 0.18	126	23.0 ± 0.27	104	27.8 ± 0.15	103	31.3 ± 0.13
3rd	153	17.2 ± 0.18	131	23.2 ± 0.20	111	27.6 ± 0.15	11	31.2 ± 0.13
4th	114	16.8 ± 0.20	94	24.0 ± 0.23	81	28.1 ± 0.17	79	31.5 ± 0.14
5th	129	16.7 ± 0.19	108	23.7 ± 0.21	103	27.9 ± 0.15	100	31.4 ± 0.13
6th	60	16.5 ± 0.24	57	23.2 ± 0.28	46	27.7 ± 0.21	46	30.9 ± 0.17
Sex								
male	350	17.0 ± 0.13	303	23.3 ± 0.12	259	27.8 ± 0.09	251	31.4 ± 0.09
female	376	16.6 ± 0.13	292	23.4 ± 0.12	249	27.7 ± 0.09	249	31.2 ± 0.09
Regressions								
Body weight		.003 ± 0.001		-.001 ± .001		.001 ± .0003		.002 ± .0003
LSB		0.01 ± 0.03		•.05 ± 0.05		0.08 ± .0.04		0.04 ± .0.03
Baladi Red								
Overall mean	485	16.9 ± 0.14	400	23.1 ± 0.13	436	27.1 ± 0.18	327	30.7 ± 0.16
Year of birth								
1st	175	17.1 ± 0.29	142	23.1 ± 0.38	123	27.5 ± 0.34	115	31.7 ± 0.41
2nd	158	16.5 ± 0.21	130	23.2 ± 0.26	113	27.2 ± 0.26	113	30.8 ± 0.30
3rd	152	17.0 ± 0.26	128	23.0 ± 0.35	110	26.5 ± 0.32	99	29.6 ± 0.40
Season of birth								
Autumn	119	17.3 ± 0.24	90	23.2 ± 0.33	78	27.0 ± 0.31	77	30.5 ± 0.39
Winter	128	17.2 ± 0.21	109	23.0 ± 0.26	94	27.1 ± 0.27	88	30.4 ± 0.32
Spring	151	16.4 ± 0.19	128	227 ± 0.21	116	27.1 ± 0.22	109	30.8 ± 0.24
Summer	87	16.4 ± 0.24	73	23.6 ± 0.31	58	27.2 ± 0.31	53	31.2 ± 0.40
Parity								
1st	102	16.9 ± 0.22	82	23.6 ± 0.29	71	27.1 ± 0.28	69	30.3 ± 0.33
2nd	115	16.5 ± 0.19	92	23.0 ± 0.23	82	27.0 ± 0.24	79	30.5 ± 0.28
3rd	112	16.9 ± 0.19	96	23.3 ± 0.23	84	27.0 ± 0.24	78	30.4 ± 0.27
4th	92	16.8 ± 0.20	79	24.0 ± 0.23	69	28.1 ± 0.17	63	30.7 ± 0.30
5th	41	16.7 ± 0.21	31	23.2 ± 0.27	26	26.9 ± 0.26	23	31.5 ± 0.64
6th	23	16.8 ± 0.36	21	23.0 ± 0.48	15	27.2 ± 0.47	15	31.0 ± 0.56
Sex								
male	247	16.9 ± 0.16	203	22.9 ± 0.17	181	27.1 ± 0.20	173	30.9 ± 0.19
female	238	16.8 ± 0.16	197	23.3 ± 0.17	165	27.1 ± 0.21	154	305 ± 0.20
Regressions								
Body weight		.001 ± 0.001		.001 ± .001		.001 ± .001		.002 ± .001
Litter size at birth		0.03 ± 0.04		•.58 ± 0.06		-0.02 ± .0.01		0.02 ± .0.10

Table 6: Least-squares means and standard errors (S.E) for factors affecting body measurements (Loin length) in Bauscat and Baladi Red rabbits.

Independent variable	Loin length at							
	4 weeks		8 weeks		12 weeks		14 weeks	
Bauscat	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E
Overall mean	726	5.7 ± 0.07	595	8.3 ± 0.07	508	9.8 ± 0.11	500	11.3 ± 0.05
Year of birth								
1st	244	5.5 ± 0.13	170	8.3 ± 0.22	148	9.8 ± 0.23	143	11.3 ± 0.14
2nd	199	5.9 ± 0.10	167	8.5 ± 0.15	150	9.9 ± 0.17	149	11.4 ± 0.09
3rd	283	5.7 ± 0.12	258	8.2 ± 0.18	210	9.7 ± 0.20	208	11.4 ± 0.12
Season of birth								
Autumn	124	5.7 ± 0.12	87	7.9 ± 0.20	71	9.3 ± 0.21	69	11.2 ± 0.13
Winter	205	5.6 ± 0.09	161	7.9 ± 0.13	128	9.7 ± 0.16	124	11.1± 0.09
Spring	263	5.7 ± 0.09	225	8.3 ± 0.12	198	9.7 ± 0.15	198	11.6± 0.08
Summer	134	5.8 ± 0.11	122	9.2 ± 0.17	111	10.3 ± 0.19	109	11.4± 0.11
Parity								
1st	111	5.5 ± 0.12	79	8.6 ± 0.21	63	9.8 ± 0.22	61	11.4 ± 0.13
2nd	159	5.7 ± 0.10	126	8.3 ± 0.16	104	9.5 ± 0.18	103	11.5 ± 0.10
3rd	153	5.8 ± 0.11	131	8.3 ± 0.20	111	9.8± 0.17	11	11.3 ± 0.10
4th	114	5.7 ± 0.12	94	8.4 ± 0.18	81	9.9± 0.19	79	11.5 ± 0.12
5th	129	5.7 ± 0.11	108	8.1 ± 0.16	103	10.0 ± 0.18	100	11.3 ± 0.10
6th	60	5.8 ± 0.14	57	8.2 ± 0.22	46	9.6 ± 0.23	46	11.0 ± 0.14
Sex								
male	350	5.8 ± 0.08	303	8.3 ± 0.09		9.8 ± 0.13	251	11.3± 0.06
female	376	5.6 ± 0.08	292	8.4 ± 0.09		9.8 ± 0.13	249	11.3± 0.06
Regressions								
Body weight		.000.3 ± .0003		-.0001 ± .0001		.001 ± .0003		.001 ± .0002
LSB		0.01 ± 0.02		0.95 ± 0.04		0.10 ± 0.04		0.10 ± 0.02
Baladi Red								
Overall mean	485	5.5 ± 0.10	400	8.4 ± 0.33	436	9.5 ± 0.14	327	11.3 ± 0.07
Year of birth								
1st	175	5.7 ± 0.18	142	9.0 ± 0.74	123	9.5 ± 0.25	115	11.0± 0.17
2nd	158	5.4 ± 0.13	130	8.1 ± 0.54	113	9.3 ± 0.19	113	11.3 ± 0.13
3rd	152	5.5 ± 0.16	128	8.1 ± 0.68	110	9.9 ± 0.24	99	11.5 ± 0.16
Season of birth								
Autumn	119	5.6 ± 0.15	90	7.7 ± 0.64	78	10.3 ± 0.23	77	11.4 ± 0.16
Winter	128	5.8 ± 0.13	109	8.4 ± 0.52	94	9.9 ± 0.20	88	11.2 ± 0.13
Spring	151	5.4 ± 0.12	128	8.2 ± 0.45	116	9.5 ± 0.16	109	11.2± 0.10
Summer	87	5.4 ± 0.15	73	9.2 ± 0.61	58	8.5 ± 0.23	53	11.3 ± 0.17
Parity								
1st	102	5.7 ± 0.14	82	8.9 ± 0.57	71	9.4± 0.20	69	11.2 ± 0.14
2nd	115	5.4 ± 0.12	92	8.9 ± 0.49	82	9.5 ± 0.78	79	11.2 ± 0.12
3rd	112	5.5 ± 0.12	96	7.9 ± 0.49	84	9.7 ± 0.18	78	11.4 ± 0.11
4th	92	5.4 ± 0.13	79	7.9 ± 0.54	69	9.6 ± 0.19	63	11.2 ± 0.12
5th	41	5.6± 0.21	31	8.3 ± 0.95	26	10.1 ± 0.33	23	11.3 ± 0.26
6th	23	5.6 ± 0.23	21	8.2 ± 0.92	15	9.2 ± 0.34	15	11.3 ± 0.23
Sex								
male	247	5.4 ± 0.10	203	8.2 ± 0.38	181	9.6 ± 0.15	173	11.3 ± 0.09
female	238	5.6 ± 0.10	197	8.5 ± 0.38	165	9.5 ± 0.15	154	11.3 ± 0.09
Regressions								
Body weight		-.0002 ± .001		-.001 ± .001		.0001 ± .0003		.001 ± .0002
Litter size at birth		0.003 ± 0.02		0.10 ± 0.10		-0.04 ± 0.03		-0.03 ± 0.02

Table 7: Least-squares means and standard errors (S.E) for factors affecting body measurements (Chest circumference) in Bauscat and Baladi Red rabbits.

Independent variable	Chest circumference at							
	4 weeks		8 weeks		12 weeks		14 weeks	
Bauscat	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E
Overall mean	726	14.8 ± 0.11	595	19.4 ± 0.12	508	22.7 ± 0.12	500	24.7 ± 0.09
Year of birth								
1st	244	14.1± 0.22	170	19.5 ± 0.27	148	22.7 ± 0.26	143	24.7 ± 0.26
2nd	199	15.1 ± 0.17	167	19.7± 0.19	150	22.5 ± 0.19	149	24.6 ± 0.17
3rd	283	15.1 ± 0.19	258	19.1 ± 0.23	210	22.9 ± 0.22	208	24.7 ± 0.22
Season of birth								
Autumn	124	15.0 ± 0.20	87	19.2 ± 0.24	71	23.3 ± 0.24	69	24.6 ± 0.24
Winter	205	14.6 ± 0.15	161	18.9 ± 0.18	128	22.4 ± 0.18	124	25.1 ± 0.17
Spring	263	14.5± 0.15	225	19.3 ± 0.17	198	22.9 ± 0.16	198	24.5 ± 0.15
Summer	134	14.9 ± 0.19	122	20.3 ± 0.22	111	22.2 ± 0.21	109	24.4 ± 0.20
Parity								
1st	111	14.7 ± 0.20	79	18.8 ± 0.25	63	22.2 ± 0.25	61	24.9 ± 0.25
2nd	159	14.9 ± 0.17	126	19.5 ± 0.20	104	23.0 ± 0.20	103	24.5 ± 0.19
3rd	153	15.1 ± 0.17	131	19.4 ± 0.20	111	22.7 ± 0.19	11	24.5 ± 0.18
4th	114	14.7 ± 0.19	94	19.8 ± 0.22	81	22.7 ± 0.22	79	25.0 ± 0.22
5th	129	14.8 ± 0.18	108	19.5 ± 0.21	103	22.7 ± 0.20	100	24.7 ± 0.19
6th	60	14.5 ± 0.23	57	19.5 ± 0.26	46	22.7 ± 0.26	46	24.3 ± 0.26
Sex								
male	350	15.0 ± 0.13	303	19.4 ± 0.14	259	22.7 ± 0.14	251	24.8 ± 0.12
female	376	14.6 ± 0.13	292	19.5 ± 0.14	249	22.7 ± 0.14	249	24.5± 0.12
Regressions								
Body weight		.003 ± .001		-.0001 ± .0001		.001 ± .0003		.001 ± .0004
LSB		0.03± 0.0.03		0.03 ± 0.04		-0.1 ± 0.04		0.03 ± 0.04
Baladi Red								
Overall mean	485	14.6 ± 0.13	400	19.3 ± 0.19	436	22.7 ± 0.19	327	24.4 ± 0.16
Year of birth								
1st	175	14.8 ± 0.28	142	18.4 ± 0.35	123	22.5 ± 0.31	115	24.5 ± 0.25
2nd	158	14.2 ± 0.20	130	19.4 ± 0.27	113	22.8 ± 0.25	113	24.7 ± 0.21
3rd	152	14.9 ± 0.25	128	20.2 ± 0.32	110	22.7 ± 0.30	99	24.0± 0.24
Season of birth								
Autumn	119	15.1 ± 0.23	90	20.1 ± 0,31	78	22.9 ± 0.29	77	24.6 ± 0.24
Winter	128	14.9 ± 0.20	109	19.2 ± 0.26	94	22.8 ± 0.26	88	24.7 ± 0.21
Spring	151	14.4 ± 0.18	128	19.0 ± 0.24	116	22.3 ± 0.22	109	24.4 ± 0.18
Summer	87	14.1 ± 0.28	73	19.0 ± 0.30	58	22.7 ± 0.29	53	24.1 ± 0.25
Parity								
1st	102	14.6 ± 0.21	82	19.8 ± 0.28	71	22.9 ± 0.26	69	24.3± 0.22
2nd	115	14.4 ± 0.18	92	19.4 ± 0.25	82	22.7 ± 0.24	79	24.2 ± 0.20
3rd	112	14.9 ± 0.19	96	19.2 ± 0.25	84	22.8 ± 0.24	78	24.4 ± 0.19
4th	92	14.6 ± 0.20	79	19.6 ± 0.27	69	22.0 ± 0.25	63	24.5 ± 0.20
5th	41	15.0 ± 0.33	31	19.4 ± 0.44	26	22.3 ± 0.41	23	24.4 ± 0.35
6th	23	14.5 ± 0.35	21	18.5 ± 0.42	15	23.5 ± 0.42	15	24.8 ± 0.31
Sex								
male	247	14.6 ± 0.25	203	19.2 ± 0.21	181	22.6 ± 0.21	173	24.4 ± 0.17
female	238	14.7 ± 0.15	197	19.4 ± 0.21	165	22.7 ± 0.21	154	24.4 ± 0.17
Regressions								
Body weight		.001 ± .001		.001 ± .001		.0001 ± .0004		.001 ± .0003
Litter size at birth		0.04 ± 0.04		0.05 ± 0.10		-0.02 ± 0.04		-0.10 ± 0.03

Table 8: Least-squares means and standard errors (S.E) for factors affecting body measurements (Chest width) in Bauscat and Baladi Red rabbits.

Independent variable	Chest width at							
	4 weeks		8 weeks		12 weeks		14 weeks	
Bauscat	**No**	**Means ± S.E**	**No**	**Means ± S.E**	**No**	**Means ± S.E**	**No**	**Means ± S.E**
Overall mean	726	5.0 ± 0.09	595	8.9 ± 0.11	508	11.9 ± 0.09	500	13.2 ± 0.10
Year of birth								
1st	244	4.8 ± 0.13	170	8.9 ± 0.22	148	12.0 ± 0.19	143	13.1 ± 0.20
2nd	199	4.9 ± 0.11	167	9.0 ± 0.16	150	11.8 ± 0.14	149	12.8 ± 0.15
3rd	283	5.1 ± 0.12	258	9.0 ± 0.19	210	12.0 ± 0.17	208	13.6± 0.17
Season of birth								
Autumn	124	3.7 ± 0.13	87	7.2 ± 0.20	71	12.2 ± 0.18	69	13.2 ± 0.19
Winter	205	5.0 ± 0.10	161	9.8 ± 0.15	128	12.5 ± 0.13	124	13.5 ± 0.14
Spring	263	5.1 ± 0.10	225	9.4 ± 0.14	198	11.2 ± 0.12	198	13.2 ± 0.13
Summer	134	6.0 ± 0.12	122	9.0 ± 0.18	111	12.0 ± 0.16	109	12.8 ± 0.16
Parity								
1st	111	5.0 ± 0.13	79	8.6 ± 0.21	63	11.8 ± 0.19	61	13.3 ± 0.19
2nd	159	5.1 ± 0.11	126	9.0 ± 0.17	104	11.9 ± 0.15	103	12.9 ± 0.15
3rd	153	4.9 ± 0.11	131	9.2 ± 0.17	111	12.0 ± 0.15	11	13.2 ± 0.15
4th	114	4.9 ± 0.12	94	8.9 ± 0.19	81	12.3 ± 0.16	79	13.3 ± 0.17
5th	129	5.0 ± 0.12	108	8.8 ± 0.18	103	12.0 ± 0.15	100	13.4 ± 016
6th	60	4.8 ± 0.14	57	8.8 ± 0.22	46	11.7 ± 0.19	46	12.8 ± 0.20
Sex								
male	350	5.0 ± 0.09	303	8.9 ± 0.13	259	11.9 ± 0.10	251	13.2 ± 0.12
female	376	4.9 ± 0.09	292	8.8 ± 0.13	249	12.0 ± 0.11	249	13.1 ± 0.12
Regressions								
Body weight		.001 ± .0004		-.00004± .0001		.001 ± .0003		.0003 ± .0003
LSB		0.02± 0.02		0.03 ± 0.03		0.10 ± 0.03		0.10 ± 0.03
Baladi Red								
Overall mean	485	4.9 ± 0.13	400	9.2 ± 0.12	436	11.1 ± 0.25	327	12.7 ± 0.15
Year of birth								
1st	175	4.7 ± 0.16	142	9.1 ± 0.27	123	10.2 ± 0.38	115	12.3 ± 0.28
2nd	158	5.1 ± 0.15	130	9.6 ± 0.20	113	11.3 ± 0.31	113	12.9 ± 0.22
3rd	152	4.7 ± 0.17	128	8.9 ± 0.25	110	11.7 ± 0.36	99	12.9 ± 0.28
Season of birth								
Autumn	119	5.1 ± 0.17	90	9.4 ± 0.24	78	12.4 ± 0.36	77	13.4 ± 0.27
Winter	128	4.5 ± 0.15	109	8.5 ± 0.19	94	10.9 ± 0.31	88	13.0 ± 0.23
Spring	151	4.8 ± 0.15	128	8.9 ± 0.17	116	10.5 ± 0.28	109	12.2 ± 0.19
Summer	87	5.0 ± 0.16	73	10.5 ± 0.23	58	10.0 ± 0.35	53	12.3± 0.28
Parity								
1st	102	4.7 ± 0.16	82	9.8± 0.21	71	11.1 ± 0.32	69	12.7 ± 0.23
2nd	115	5.2 ± 0.15	92	9.7 ± 0.18	82	11.0 ± 0.30	79	12.7 ± 0.21
3rd	112	4.9 ± 0.15	96	9.6 ± 0.18	84	11.3 ± 0.29	78	12.9 ± 0.20
4th	92	5.2 ± 0.15	79	9.6 ± 0.20	69	11.0 ± 0.31	63	12.7 ± 0.22
5th	41	4.9 ± 0.21	31	7.7 ± 0.35	26	10.8 ± 0.49	23	12.6 ± 0.42
6th	23	4.3 ± 0.22	21	9.0 ± 0.34	15	11.2 ± 0.50	15	13. ± 0.37
Sex								
male	247	4.9 ± 0.14	203	9.4 ± 0.14	181	11.1 ± 0.26	173	12.7 ± 0.17
female	238	4.9 ± 0.14	197	9.1 ± 0.14	165	11.0± 0.27	154	12.7 ± 0.17
Regressions								
Body weight		.001 ± .0004		001 ± .0004		0002 ± .0004		.001 ± .0004
Litter size at birth		-0.02 ± 0.02		-0.10 ± 0.04		.0003 ± .001		-0.02 ± 0.02

Table 9: Least-squares means and standard errors (S.E) for factors affecting body measurements (Loin width) in Bauscat and Baladi Red rabbits.

Independent variable	Loin width							
	4 weeks		8 weeks		12 weeks		14 weeks	
Bauscat	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E	No	Means ± S.E
Overall mean	726	3.7 ± 0.03	595	5.5 ± 0.05	508	6.3 ± 0.04	500	7.2 ± 0.04
Year of birth								
1st	244	3.6 ± 0.07	170	5.5 ± 0.10	148	6.4 ± 0.10	143	7.2 ± 0.11
2nd	199	3.7 ± 0.05	167	5.6 ± 0.07	150	6.2 ± 0.07	149	7.1 ± 0.07
3rd	283	3.8 ± 0.06	258	6.2 ± 0.08	210	6.2 ± 0.13	208	7.3 ± 0.09
Season of birth								
Autumn	124	3.5 ± 0.06	87	5.9 ± 0.09	71	6.7 ± 0.09	69	7.0 ± 0.10
Winter	205	3.4 ± 0.04	161	5.0 ± 0.07	128	6.3 ± 0.07	124	7.2 ± 0.07
Spring	263	3.7 ± 0.04	225	5.2 ± 0.06	198	5.8 ± 0.06	198	7.1 ± 0.06
Summer	134	4.1 ± 0.06	122	5.9 ± 0.08	111	6.2 ± 0.08	109	7.4 ± 0.09
Parity								
1st	111	3.8 ± 0.06	79	5.5 ± 0.09	63	6.2 ± 0.10	61	7.3 ± 0.10
2nd	159	3.6 ± 0.05	126	5.6 ± 0.07	104	6.3 ± 0.07	103	7.1 ± 0.08
3rd	153	3.8 ± 0.05	131	5.6 ± 0.07	111	6.3 ± 0.07	11	7.2 ± 0.08
4th	114	3.7 ± 0.06	94	5.4 ± 0.08	81	6.3 ± 0.08	79	7.1 ± 0.09
5^{th}	129	3.7 ± 0.05	108	5.5 ± 0.08	103	6.2 ± 0.07	100	7.3 ± 0.08
6^{th}	60	3.6 ± 0.07	57	5.4 ± 0.09	46	6.3 ± 0.10	46	7.2 ± 0.11
Sex								
male	350	3.7 ± 0.04	303	5.5 ± 0.06	259	6.3 ± 0.05	251	7.2 ± 0.05
female	376	3.6 ± 0.03	292	5.5 ± 0.06	249	6.2 ± 0.05	249	7.2 ± 0.05
Regressions								
Body weight		.001 ± .0002		.0001 ± .00001		.0003± .0001		.001 ± .0002
LSB		0.01 ± 0.14		0.01 ± 0.01		0.001 ± -0.20		0.04 ± 0.02
Baladi Red								
Overall mean	485	3.6 ± 0.03	400	5.0 ± 0.10	436	6.0 ± 0.10	327	6.8 ± 0.05
Year of birth								
1st	175	3.6 ± 0.08	142	5.0 ± 0.18	123	5.6 ± 0.13	115	6.5 ± 0.11
2nd	158	3.7 ± 0.06	130	5.1 ± 0.14	113	6.0 ± 0.11	113	7.0 ± 0.08
3rd	152	3.7 ± 0.08	128	5.0 ± 0.16	110	6.0 ± 0.12	99	6.9 ± 0.11
Season of birth								
Autumn	119	3.8 ± 0.10	90	5.4 ± 0.16	78	5.9 ± 0.12	77	6.8 ± 0.11
Winter	128	3.6 ± 0.06	109	4.7 ± 0.14	94	5.9 ± 0.11	88	6.9 ± 0.09
Spring	151	3.5 ± 0.05	128	4.8 ± 0.12	116	6.0 ± 0.10	109	6.5 ± 0.07
Summer	87	3.5 ± 0.07	73	5.3 ± 0.15	58	6.1 ± 0.12	53	6.9± 0.11
Parity								
1st	102	3.6 ± 0.06	82	5.1 ± 0.15	71	6.2 ± 0.11	69	7.0 ± 0.09
2nd	115	3.7 ± 0.05	92	5.1 ± 0.13	82	6.1 ± 0.11	79	6.9 ± 0.08
3rd	112	3.7 ± 0.06	96	5.1± 0.13	84	5.8 ± 0.11	78	6.8 ± 0.08
4th	92	3.7 ± 0.06	79	5.3± 0.14	69	5.9 ± 0.11	63	6.8 ± 0.08
5^{th}	41	3.6 ± 0.06	31	5.0 ± 0.22	26	5.8 ± 0.16	23	6.6 ± 0.17
6^{th}	23	3.5 ± 0.11	21	4.6 ± 0.21	15	5.9 ± 0.16	15	6.6 ± 0.15
Sex								
male	247	3.6 ± 0.04	203	5.0 ± 0.11	181	6.0 ± 0.10	173	6.8 ± 0.06
female	238	3.7 ± 0.04	197	5.1 ± 0.11	165	5.9 ± 0.10	154	6.8 ± 0.06
Regressions								
Body weight		.00004 ± .0002		.0001 ± .0003		.0003 ± .0001		.0002 ± .0002
Litter size at birth		-0.02 ± 0.01		0.03 ± 0.02		0.01 ± 0.01		-0.02 ± 0.02

Results in (Tables 5, 6, 7, 8 and 9) revealed that, no clear trend could be observed for the effect of season of birth on body measurements (BL, LL, CC, WC and WL) measured at different ages from weaning up to 14 weeks of age in both breeds. Similarly, Hassan, (1988); Abdel-Ghany et al, (2001) and Hassan et al, (2001) reported the same result with different breeds of rabbits. Ahmed (1997) reported that the effect of season of birth on body weight might be a reflection of the changes in temperature. feed quality and differences in milk production of doe from one season to another.

Parity:

No significant ($P \leq 0.05$) effect (Table 2, 3 and 4) was detected for parity on most body measurements traits at most ages studied in both breeds, except, at 8 and 14 weeks for BL, at 4 weeks for LL, at 14 weeks for WC and at 4 weeks for WL in B rabbits and at 12 weeks for CC. at 4 weeks for WC and 12 weeks for WL in BR rabbits. was found to be significant ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$). The same findings were observed by (Hassan, 1988); Abdel-Ghany et al, 2001 and Hassan et al, 2001)

In the present study, no clear trend could be observed for the effect of parity on body measurements traits (BL. LL. CC. CW and LW) recorded at different ages from weaning up to 14 weeks of age in both breeds studied (Table 5, 6, 7, 8 and 9). On the contrary Hassan. (1988) with different breeds of rabbits showed that rabbits born in the third parity had slightly longer than these born in the first and second parity on (BL, LL, CC. WC and WL) at all ages studied.

Abdel-Ghany et al (2001) and Hassan et al (2001) with different breeds of rabbits reported that a general trend indicating that BL and CC at different ages increased with advance of parity and as a consequence it is virtually greatest at the 3rd parity.

Sex:

Results in Tables (2, 3 and 4) revealed that the effect of sex was not significant at all ages studied except at 4 and 14 weeks for BL, at 4 weeks for CC and at 4 and 14 weeks for WL in B rabbits and at 14 weeks for BL and at 4 weeks for LL in BR rabbits. The same findings were observed by Hassan (1988), Abdel-Ghany et al (2001) and Hassan et al (2001) on BL and CC. Also, Luzi et al (2000) found no significant differences according to sex amongst body measurements (body length; rump length; abdomen circumference; thigh circumference and chest circumference) of live animals till 120 days of age using commercial crossbred rabbits.

Lest squares means of body measurements in Tables (5, 6, 7, 8 and 9), show that males scored somewhat greater body measurements than females at most ages studied. The same trend were observed by Hassan (1988) and Abdel-Ghany et al (2001). Also, Luzi et al (2000) couldn't detect any sex consistent trend on live animals BL from weaning till 120 days of age. Hassan et al. (2001) couldn't detect any sex consistent trend on CC from weaning till 12 weeks of age.

Genetic Aspects:

Sire effect:

Results in Table (2.3 and 4) revealed that the sire effect was significant ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$) on body measurements at 4 and 14 weeks for BL; at 4 and 12 weeks for LL; at 4 weeks for CC; at 4, 8 and 14 for CW in B rabbits; at 4, 12 and 14 weeks for BL; at 4 and 12 weeks for LL; at 4, 8 12 and 14 weeks for CC; at 4, 12 and 14 weeks for CW and at 8, 12 and 14 weeks for LW in BR rabbits. Estimates of percentage of variance components due to the sire effect in B and BR rabbits, ranged from 0.19 to 5.0% in B rabbits and from 0.22 to 14.3% in BR rabbits (Table 10). Variance components due to sire effect were somewhat low in both breeds. Similarly, El-Deghadi, (1996) and Ahmed. (1997) using Henderson III method with different breed groups observed low to moderate estimates of sire variance components for growth traits.

Heritability effect (h^2_s):

Estimates of heritability for body measurements ranged from 0.01 to 0.21 in B rabbits and from 0.04 to 0.58 in BR rabbits (Table 10). Estimates of heritability in Baladi Red rabbits are higher than those in Bauscat rabbits, in most cases. In Practice, these high estimates of h^2_S may be used by rabbit breeders in Egypt to improve body measurements of Baladi Red rabbits through selection.

Khalil et al, (1987) indicated that sire heritability estimates of body weights for the local breed (Giza White) were higher than those estimated for the exotic breed (Bauscat), was attributed to that local breeds were not subjected to any intensive program of selection. as that experienced in exotic ones.

Table 10: Heritability estimates (h_s^2) and their standard errors and percentages of variance (V%) for body measurements recorded at different ages in Bauscat and Baladi Red rabbits.

Traits	Bauscat			Baladi Red		
	d.f	$h^2 \pm$ S.E.	V %	d.f	$h^2 \pm$ S.E.	V %
body length at						
4 Weeks	14	0.10 ± 0.10	2.1	13	0.13 ± 0.10	3.4
8Weeks	14	a	a	13	0.01 ± 0.09	0.22
12 Weeks	14	a	a	13	0.19 ± 0.13	4.6
14 Weeks	14	0.12 ± 0.10	3.1	13	0.02 ± 0.01	5.3
Loin length at						
4 Weeks	14	0.10 ± 0.07	2.6	13	0.12 ± 0.10	2.5
8Weeks	14	a	a	13	0.09± 0.9	2.3
12 Weeks	14	0.11± 0.09	2.7	13	0.19 ± 0.13	4.7
14 Weeks	14	a	a	13	0.10 ± 0.10	1.6
Chest circumference at						
4 Weeks	14	0.08 ± 0.06	2.0	13	0.11 ± 0.09	3.0
8Weeks	14	0.11 ± 0.08	2.7	13	0.22 ± 0.13	5.4
12 Weeks	14	0.08 ± 0.08	2.5	13	0.31 ± 0.17	7.6
14 Weeks	14	0.01 ± 0.06	0.19	13	0.41 ± 0.20	10.3
Chest width at						
4 Weeks	14	0.04 ± 0.05	1.0	13	0.51 ± 0.20	10.1
8Weeks	14	0.11 ± 0.08	2.7	13	0.11 ± 0.10	2.6
12 Weeks	14	0.09 ± 0.08	1.0	13	0.39 ± 0.19	9.6
14 Weeks	14	0.14 ± 0.09	3.4	13	0.19 ± 0.13	4.9
Loin width						
4 Weeks	14	0.21 ± 0.10	5.0	13	0.04 ± 0.07	1.1
8Weeks	14	0.12± 0.08	3.1	13	0.26 ± 0.14	6.9
12 Weeks	14	0.05 ± 0.7	1.0	13	0.58 ± 0.23	14.3
14 Weeks	14	0.04 ± 0.08	1.1	13	0.13 ± 0.12	3.8

a = Negative estimate of sire component of variance were set to be zero.

Regression coefficients:

The linear regression coefficients of body measurements as covariant on body weight (Table 2, 3 and 4) were significant (P ≤0.05, P ≤0.01 or P ≤0.001) at 4, 12 and 14 weeks for BL; at 8 and 12 weeks for LL; at 4 and 14 weeks for CC; at 4 weeks for CW and at 4, 8, 12 and 14 weeks for LW in B rabbits and at 8 and 14 weeks for BL: at 14 weeks for LL; at 8 and 14 weeks for CC and at 8 and 14 weeks for CW in BR rabbits. These results, are in agreement with those of Abdel-Ghany et al (2001) and Hassan et al (2001) on most body measurements at most ages studiedFor LSB on the same traits there were non-significant regression except at 8 weeks for LL , at 12 weeks for CC and at 14 weeks for LW in B, at 8 weeks for CC and at 8 and 12 weeks for CW in BR were significant (P<0.05, P<0.01or P<0.001). Abdel-Ghany et al (2001) and

Hassan et al (2001) reported that LSB was a significant (P<0.05, P<0.01or P<0.001) for BL and CC at most ages studies in different breeds . Estimates of the regression of body measurements on body weight and litter size at birth (Table 3) were generally low and did not show any consistent trend in both breeds.

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العوامل المؤثرة على مقاييس الجسم عند الفطام و بعد الفطام فى أرانب البوسكات والبلدي الأحمر

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الملخص العربي

أجريت هذه الدراسة في مزرعة الأرانب البحثية بكلية الزراعة- جامعة الأزهر بمدينة نصر- مصر خلال ثلاث سنوات إنتاجية متتالية بدأت في سبتمبر ١٩٩٨م حتى أكتوبر ٢٠٠١م وقد استخدمت بيانات ٧٢٦ أرنب مفطوم من البوسكات و ٤٨٥ من البلدي الأحمر وذلك لتقييم أداء هاتين السلالتين لبعض مقاييس الجسم (طول الجسم- طول القطن- محيط الصدر- عرض الصدر و عرض القطن):

- أظهرت أرانب البوسكات تفوقا نسبيا على أرانب البلدي الأحمر في معظم الصفات المدروسة.
- انخفض معامل الاختلاف بتقدم العمر في صفات مقاييس الجسم (طول الجسم- طول القطن - محيط الصدر- عرض الصدر و عرض القطن):
- أظهرت سنة الميلاد تأثير معنوي عند ٤ و ١٤ أسبوع لصفة طول الجسم، عند ١٤ أسبوع لصفة محيط الصدر و عند ٤، ٨، ١٢و ١٤ أسبوع لصفة عرض الصدر و عند ١٤ أسبوع لصفة عرض القطن في سلالة البوسكات وعند ٤و ٨ أسبوع لصفة طول الجسم و عند ٤، ٨ و ١٤ أسبوع لصفة محيط الصدر و عند ٤، ٨ و ١٢ أسبوع لصفة عرض الصدر و عند ١٤ أسبوعا لصفة عرض القطن في سلالة البلدي الأحمر.
- كان لموسم الميلاد تأثير معنوي عند ١٤ أسبوع لصفة طول الجسم وعند ١٢ أسبوع لصفة طول القطن و عند ٤، ٨ و ١٢ أسبوع لصفة محيط الصدر في سلالة البوسكات وعند ٤و ١٤ أسبوع لصفة طول الجسم و عند ٨، ١٢و ١٤ أسبوع لصفة طول القطن و عند ٤، ٨ و ١٢ أسبوع لصفة محيط الصدر و عند ٤، ٨ ، ١٢و ١٤ أسبوع لصفة عرض الصدر و عند ٤، ٨ و١٤ أسبوع لصفة عرض القطن في سلالة البلدي الحمراء.
- كان لترتيب الولادة تأثيرا غير معنوي على معظم الصفات المدروسة ولا يوجد اتجاه محدد لتأثير ترتيب الولادة على معظم الصفات في كلا النوعين.
- لم يكن للجنس آي تأثير معنوي على صفات مقاييس الجسم و لوحظ تفوق الذكور إلى حد ما عن الإناث في كلتا السلالتين.

- كان تأثير الأب معنوي عند ٤ و ١٤ أسبوع لصفة طول الجسم و عند ٤ و ١٢ أسبوع لصفة طول القطن و عند ٤ أسبوع لصفة محيط الصدر وعند ٤، ٨ و ١٤ أسبوع لصفة عرض الصدر في سلالة البوسكات وعند ٤ ، ١٢و ١٤ أسبوع لصفة طول الجسم و عند ٤ و١٢ أسبوع لصفة طول القطن و عند ٤، ٨، ١٢ و١٤ أسبوع لصفة محيط الصدر و عند ٤، ١٢و ١٤ أسبوع لصفة عرض الصدر و عند ٨، ١٢و ١٤ أسبوع لصفة عرض القطن في سلالة البلدي الاحمر.

- تراوحت قيم النسبة المئوية لمكونات التباين الوراثي الراجع للأب المقدرة بطريقة هند رسون(٣) في كلتا السلالتين بين القيم المنخفضة والمتوسطة وان كانت قيم هذه النسبة في سلالة البلدي الأحمر أعلى منها في سلالة البوسكات لمعظم الصفات.

- كانت تقديرات المكافئ الوراثي لمعظم صفات مقاييس الجسم المختلفة في سلالة البلدي الأحمر أعلي منها في سلالة البوسكات.

- كان لتقديرات معامل انحدار تلك الصفات على وزن الجسم عند نفس العمر تأثيرا معنويا عند ٤، ١٢و ١٤ أسبوع لصفة طول الجسم و عند ٨ و ١٢ أسبوع لصفة طول القطن وعند ٤ و ١٤ أسبوع لصفة محيط الصدر و عند ١٤ أسبوع لصفة عرض الصدر و عند ٤ ، ٨، ١٢و١٤ أسبوع لصفة عرض القطن في سلالة البوسكات وعند ٨ و ١٤ أسبوع لصفة طول الجسم و عند ١٤ أسبوع لصفة طول القطن و عند ٨ و ١٤ أسبوع لصفة محيط الصدر و عند ٨ و ١٤ أسبوع لصفة عرض الصدر في سلالة البلدي الأحمر.

- كان لتقديرات معامل انحدار تلك الصفات على حجم البطن عند الولادة تأثيرا غير معنوي عند معظم الصفات محل الدراسة.

وعلى ضوء نتائج تقديرات المكافئ الوراثي يمكن التوصية. بإمكانية تحسين هذه الصفات في الأرنب البلدي الأحمر لدى مربى الأرانب في مصر عن طريق الانتخاب.