RESULTS AND DISCUSSION

A- HEAT TOLERANCE TRAITS

1. Body Temperature

a. Body Temperature in Does

The overall means of body temperature in Giza White, Bauscat and Grey Flander rabbits were 38.87, 39.90 and 38.91°C, respectively, in the morning and 39.04, 40.04 and 39.06°C, respectively, in the afternoon (Table 3). Both Giza White and Grey Flander does were nearly of the same body temperature (about 39°C) in the morning and in the afternoon. Body temperature of Bauscat was higher than that of does of any of the other two breeds by one degree centigrade in both times of measurement.

Means of the morning and afternoon body temperatures in the three breeds showed a tendency indicating that afternoon body temperature was slightly higher than morning body temperature. This may be due to the fact that the average of annual afternoon air temperature (24.70°C) was higher than that of morning air temperature (20.45°C).

Month:

Tables 3 and 4 show that month differences in body temperature of does were highly significant ($P < 0.01$) in

Table ( ): Least squares constants ± standard errorsof factors affecting body temperature in does.

Classification	GIZA WHITE				BAUSCAT			GREY FLANDER		
	N	Morning	Afternoon	N	Morning	Afternoon	N	Morning	Afternoon	
		Const. ± S.E.	Const. ± S.E.		Const. ± S.E.	Const. ± S.E.		Const. ± S. E.	Const. ± S. E.	
General mean	290	38.87 ± 0.07	39.04±0.04	450	39.90 ± 0.21	40.04 ± 0.21	211	38.91 ± 0.04	39.06 ± 0.04	
Month :										
October (21.7°C.)[2]	35	-0.05 ± 0.07 ab[1]	-0.16 ± 0.08 ab	55	-0.80 ± 0.37 a	-0.78 ± 0.37 a	25	-0.07 ± 0.08 ab	-0.11 ± 0.08 acd	
November (19.5°C.)	30	-0.17 ± 0.07 b	-0.24 ± 0.08 b	50	-0.79 ± 0.37 a	-0.80 ± 0.36 a	25	-0.05 ± 0.08 ab	-0.30 ± 0.08 c	
December (14.6°C.)	26	-0.13 ± 0.07 bc	-0.27 ± 0.08 b	42	-0.63 ± 0.39 a	-0.75 ± 0.38 a	20	-0.21 ± 0.09 b	-0.24 ± 0.08 ac	
January (12.5°C.)	26	-0.02 ± 0.07 a	-0.06 ± 0.08 bd	42	-0.84 ± 0.39 a	-0.83 ± 0.38 a	20	-0.08 ± 0.08 ab	-0.05 ± 0.08 ade	
February (15.1°C.)	26	0.00 ± 0.07 a	-0.09 ± 0.08 be	42	-0.57 ± 0.39 a	-0.56 ± 0.37 a	20	0.04 ± 0.08 ab	0.07 ± 0.08 def	
March (20.2°C.)	26	0.03 ± 0.07 a	0.05 ± 0.08 adef	42	-0.11 ± 0.38 a	-0.07 ± 0.37 a	20	-0.04 ± 0.09 ab	-0.10 ± 0.08 acd	
April (24.5°C.)	30	-0.01 ± 0.07 a	0.03 ± 0.07 ade	48	-0.20 ± 0.37 a	-0.20 ± 0.36 a	21	-0.01 ± 0.09 ab	0.04 ± 0.08 deg	
May (26.9°C)	31	0.03 ± 0.07 a	0.11 ± 0.07 cde	49	-0.13 ± 0.36 a	-0.09 ± 0.35 a	21	0.04 ± 0.08 ab	0.14 ± 0.09 be	
June (29.9°C.)	24	0.14 ± 0.07 a	0.28 ± 0.08 cf	35	0.04 ± 0.41 a	0.09 ± 0.40 a	16	0.10 ± 0.09 a	0.14 ± 0.08 deh	
July (28.8°C.)	24	0.07 ± 0.07 ac	0.18 ± 0.08 cd	30	0.15 ± 0.44 a	0.18 ± 0.43 a	16	0.12 ± 0.09 a	0.23 ± 0.08 bfgh	
August (29.5°C.)	12	0.11 ± 0.10 ab	0.17 ± 0.11 cde	15	3.88 ± 0.61 b	3.89 ± 0.59 b	7	0.16 ± 0.14 ab	0.18 ± 0.13 deh	
Weight of doe										
≤ 2500 grams	139	-0.04 ± 0.03 a	-0.03 ± 0.03 a	183	0.16 ± 0.14 a	0.14 ± 0.13 a	73	-0.03 ± 0.03 a	0.01 ± 0.03 a	
> 2500 grams	151	0.04 ± 0.03 a	0.03 ± 0.03 a	267	-0.16 ± 0.14 a	-0.14 ± 0.13 a	138	0.03 ± 0.03 a	-0.01 ± 0.03 a	
Age of doe										
8 - 12 months	84	0.01 ± 0.04 a	0.04 ± 0.05 a	112	0.64 ± 0.24 a	0.64 ± 0.23 a	40	0.13 ± 0.06 a	0.08 ± 0.05 a	
> 12- 24 months	128	0.02 ± 0.03 a	0.00 ± 0.04 a	229	-0.48 ± 0.19 bc	-0.46 ± 0.18 bc	86	-0.07 ± 0.05 bc	-0.05 ± 0.04 a	
> 24 months	78	-0.03 ± 0.04 a	-0.04 ± 0.04 a	109	-0.16 ± 0.20 c	-0.18 ± 0.19 c	85	-0.06 ± 0.04 c	-0.03 ± 0.04 a	
Reproductive status :										
Pregnancy	69	-0.05 ± 0.03 a	-0.05 ± 0.03 a	120	0.29 ± 0.16 a	0.28 ± 0.16 a	66	0.03 ± 0.03 a	0.03 ± 0.03 a	
No pregnancy	201	0.05 ± 0.03 a	0.05 ± 0.03 a	330	-0.29 ± 0.16 a	-0.28 ± 0.16 a	145	-0.03 ± 0.03 a	-0.03 ± 0.03 a	
Suckling status :										
Suckling	76	-0.04 ± 0.03 a	-0.03 ± 0.04 a	112	0.51 ± 0.17 a	0.50 ± 0.16 a	60	-0.01 ± 0.03 a	-0.03 ± 0.03 a	
No suckling	214	0.04 ± 0.03 a	0.03 ± 0.04 a	338	-0.51 ± 0.17 b	-0.50 ± 0.16 b	151	0.01 ± 0.03 a	0.03 ± 0.03 a	

1 Constants, within the some classification, followed by different letters are significantly different ($P < 0.05$), otherwise they are not.

2 Average air temperature.

(The same notations are followed in similar tables).

Table (4): Least squares analysis of variance of factors affecting body temperature in does.

Source of variation	GIZA WHITE					BAUSCAT					GREY FLANDER				
		Morning		Afternoon			Morning		Afternoon			Morning		Afternoon	
	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %
Month	10	0.1662	1.23	0.5428 **	8.82	10	28.0200 **	7.67	27.4805 **	7.88	10	0.1481	0.00	0.4181 **	12.47
Weight of doe	1	0.2629	0.94	0.2210	0.34	1	8.1476	0.13	6.1418	0.00	1	0.1013	0.00	0.0255	0.00
Age of doe	2	0.0519	0.00	0.0704	0.00	2	27.6135 *	2.78	26.5448 *	2.77	2	0.4007	2.98	0.1493	0.00
Reproductive status.....	1	0.4191	2.91	0.3389	1.51	1	19.0691	1.45	18.2370	1.52	1	0.1290	0.00	0.0940	0.00
Suckling status	1	0.1710	0.44	0.0919	0.00	1	57.7838 **	6.22	56.4945 **	6.36	1	0.0143	0.00	0.0922	0.00
Residual	274	0.1286	94.48	0.1629	89.33	434	6.1845	81.75	5.8894	81.47	195	0.1465	97.02	0.1218	87.53

* P < 0.05

** P < 0.01

The same notation are followed in similar tables.

the afternoon in all used breeds, and only significant ($P<0.05$) in the morning in Bauscat breed. The averages of morning (38.96°C) and of afternoon (39.09°C) body temperature in winter months (October-March) were relatively lower than their respective values (39.53 and 39.74°C) in summer months (April-August). This may be due to the fact that the average of annual air temperature in summer months (27.89°C) was higher than that of winter months (17.06°C). Results of the present work seem to be in agreement with those of Shafie et al. (1970) who reported that maximum values of body temperature in Giza White rabbits were observed during summer months (June-August).

The difference in body temperature between winter and summer months was higher in Bausoat does (1.4°C.) than in either Giza White (0.21°C) or Grey Flander does (0.21°C). This may be due to the long time of both natural and artificial selection in Giza White rabbits for adaptation to the Egyptian weather conditions. Also, the hair and skin of Grey Flander are dark in colour and this facilitates heat dissipation from body core and surface and reduces the internal and external body temperature consequently (Abdel-Malek, 1967).

Body weight:

Constants presented in Table 3 show that body temperature of heavy does (>2.5 kg) was slightly lower than that

of light does ($\leq$ 2.5 kg). The same trend was also detected when considering the average of morning and afternoon body temperatures of heavy and light does in all breeds of study (39.27°C and 39.34°C, respectively). The differences in both morning and afternoon body temperature due to weight of doe were, however, not significant in all breeds (Table4). Accordingly, it seems that weight of doe within a breed has no effect on its body temperature.

Age of doe:

Results on the effect of age of doe on body temperature indicate that does with the first catigory (8-12 months) recorded higher body temperature than those of older ages either in the morning or in the afternoon for any of the breeds of the study (Table 3). The same observation was obtained when considering the averages of the means of morning body temperature for does of 8-12 months old and for does of more than 12 months (39.49 and 39.10°C, respectively) and the corresponding averages of afternoon body temperature (39.63 and 39.26°C, respectively). Differences in body temperature due to age of doe did not reach significance except for Bauscat does in the morning and in the afternoon (Table 4). These results are in agreement with those reported by Abdel-Malek (1967) and Kamar et al. (1970) who found that body temperature of Giza White rabbits was decreased slightly by advance in age. The relatively higher body temperature of young does may be attributed to

irritability and restlessnes with the experience of pregnancy (Hassanein, 1980).

Reproductive status:

Constants of reproductive status refer to a higher body temperature in the morning and in the afternoon for pregnant does than for non-pregnant ones in Bauscat and Grey Flander rabbits, but a reveersable observation was obtained for Giza White does (Table 3). The average of the least squares means of the three breeds showed that pregnant does recorded higher temperature than non-pregnant in the morning (39.32 vs 39.14°C) and in the afternoon (39.47 vs 39.29°C). Although differences due to reproductive status were non-significant, yet the results gave evidence for higher body temperature in pregnant does than in non-pregnant ones. This appears to be, also, in agreement with results reported on Giza White rabbits by Hassanein (1980) who showed that body temperature in pregnant does was more than in non-pregnant ones.

Suckling status:

Tables 3 and 4 show non-significant effects of suckling status on body temperature of both Giza White and Grey Flander rabbits. This effect was, however, highly significant ($P < 0.01$) in Bauscat; in which the suckling does have

higher body temperature than non-suckling ones by about 1.0°C. In this respect, Abdel-Malek (1967) and Hassanein (1980) in Giza White rabbits, found that suckling had non-significant effect on body temperature.

b- Body Temperature in Offspring

The overall means of body temperatures, in the morning and in the afternoon, at different ages of Giza White , Bauscat and Grey Flander rabbits are presented in Tables 5, 7 and 9, respectively. These means show that both Giza White and Bauscat rabbits were nearly of the same body temperature in the morning and in the afternoon at all ages. The Grey Flander rabbits, however, had a relatively lower morning and afternoon body temperatures in all comparable ages. This may be due that both Giza White and Bauscat rabbits are of the same white colour; while Grey Flander rabbits have a dark coat. The dark pigments in the coat facilitate heat exchange, so that reduces the internal and external body temperature (Abdel-Malek, 1967).

There is a tendency, in all breeds, showing that afternoon body temperature at different ages was higher than that of the morning by about 0.15-0.20°C. This is due to the fact that the average of annual afternoon air temperature (24.70°C) was higher than that of morning air temperature (20.45°C).

Means of body temperature of rabbits change slightly with advance in age but did not show any constant trend.

Sex:

The statistical analysis of sex effect on body

Table (5): Least squares constants ± standard errors of factors affecting body temperature in offspring of Giza White rabbits.

Classification	Weaning		6 Weeks		8 Weeks		10 Weeks		14 Weeks		16 Weeks	
	N	Consts. ± S.E.	N	Consts. ± S.E.	N	Const. ± S. E.	N	Const.±S.E.	N	Const.±S. E.	N	Const. ± S.E.
						Morning temperature						
General mean	121	39.26 ± 0.02	112	39.21 ± 0.03	103	39.24 ± 0.03	93	39.22 ± 0.04	51	39.51 ± 0.13	40	38.97 ± 0.12
Sex:												
Male	56	0.02 ± 0.02 a	51	-0.01 ± 0.02 a	45	0.02 ± 0.01 a	42	0.03 ± 0.01 a	16	0.03 ± 0.04 a	11	-0.02 ± 0.04a
Female	65	-0.02 ± 0.02 a	61	0.01 ± 0.02 a	58	-0.02 ± 0.01 a	51	-0.03 ± 0.01 b	35	-0.03 ± 0.04 a	29	0.02 ± 0.04 a
Air temperature:												
< 20 °C.	48	-0.03 ± 0.02 a	19	-0.04 ± 0.04 a	14	0.03 ± 0.02 a	14	-0.05 ± 0.02 a	3	-0.03 ± 0.09 a	1	-0.06 ± 0.10 a
⩾ 20 °C.	73	0.03 ± 0.02 a	93	0.04 ± 0.04 a	89	-0.03 ± 0.02 a	79	0.05 ± 0.02 b	48	0.03 ± 0.09 a	39	0.06 ± 0.10 a
Season :												
December-February	25	0.05 ± 0.03 a	15	-0.02 ± 0.05 a	10	-0.09 ± 0.04 a	2	0.09 ± 0.07 ab				
March - May	67	0.05 ± 0.02 a	73	0.01 ± 0.03 a	70	0.04 ± 0.02 b	51	-0.08 ± 0.04 a	24	0.03 ± 0.04 a	18	0.02 ± 0.03 a
June - September	29	-0.10 ± 0.03 b	24	0.01 ± 0.04 a	23	0.05 ± 0.03 b	40	-0.01 ± 0.04 b	27	-0.03 ± 0.04 a	22	-0.02 ± 0.03 a
Regression on body weight :		-0.00 ± 0.0001		0.0001 ± 0.0001		0.00 ± 0.0001		0.0003±0.0001		-0.0003±0.0002		0.0003±0.0001
						Afternoon body temperature						
General mean	121	39.37 ± 0.03	112	39.33 ± 0.02	97	39.33 ± 0.02	87	39.24 ± 0.04	50	39.37 ± 0.04	39	39.41 ± 0.09
Sex :												
Male	56	0.01 ± 0.02 a	51	-0.00 ± 0.02 a	41	-0.03 ± 0.01 a	38	0.06 ± 0.03 a	15	-0.09 ± 0.02 a	10	-0.01 ± 0.03 a
Female	65	-0.01 ± 0.02 a	61	0.00 ± 0.02 a	56	0.03 ± 0.01 b	49	-0.06 ± 0.03 a	35	0.09 ± 0.02 b	29	0.01 ± 0.03 a
Air temperature												
< 20 °C.	41	-0.16 ± 0.07 a	17	-0.09 ± 0.06 a								
20 - 29 °C.	54	0.01 ± 0.06 b	60	0.03 ± 0.04 a	63	-0.06 ± 0.01 a	47	-0.10 ± 0.08 a	15	-0.06 ± 0.02 a	12	0.01 ± 0.04 a
⩾ 30 °C.	26	0.15 ± 0.11 a	35	0.06 ± 0.05 a	34	0.06 ± 0.01 b	40	0.10 ± 0.08 a	35	0.06 ± 0.02 b	27	-0.01 ± 0.04 a
Season:												
December -February	25	0.03 ± 0.07 a	15	-0.08 ± 0.07 a								
March - May	67	0.04 ± 0.06 a	73	0.03 ± 0.04 a	74	0.03 ± 0.01 a	47	0.04 ± 0.08 a	23	0.05 ± 0.02 a	17	-0.02 ± 0.03 a
June - September	29	-0.07 ± 0.11 a	24	0.05 ± 0.06 a	23	-0.03 ± 0.01 a	40	-0.04 ± 0.08 a	27	-0.05 ± 0.02 b	22	0.02 ± 0.03 a
Regression on body weight :		-0.0002 ± 0.0002		0.0001 ± 0.0002		0.000 ± 0.0001		0.0006 ± 0.0002		-0.0001 ± 0.0001		0.000 ± 0.0001

Table (7): Least squares constants ± standard errors of factors affecting body temperature in offspring of Bauscat rabbits.

Classification	Weaning		6 weeks		8 weeks		10 weeks		12 weeks		14 weeks		16 weeks	
	N	Const. ± S.E.	N	Conts. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.
Morning body temperature														
General mean	194	39.21 ± 0.07	186	39.25 ± 0.07	178	39.13 ± 0.06	157	39.24 ± 0.02	141	39.11 ± 0.03	87	39.27 ± 0.01	78	39.12 ± 0.05
Sex:														
Male	94	0.02 ± 0.02a	92	-0.00 ± 0.02a	88	-0.00 ± 0.02a	75	-0.00 ± 0.01a	66	-0.07 ± 0.06a	29	0.01 ± 0.01a	23	-0.01 ± 0.02a
Female	100	- 0.02 ± 0.02a	94	0.00 ± 0.02a	90	0.00 ± 0.02a	82	0.00 ± 0.01a	75	0.07 ± 0.06a	58	-0.01 ± 0.01a	55	0.01 ± 0.02a
Air temperature														
< 20°C	89	-0.00 ± 0.03a	41	-0.09 ± 0.04a	72	-0.07 ± 0.02a	22	-0.05 ± 0.02a	16	0.01 ± 0.13a	11	0.01 ± 0.01a	6	-0.09 ± 0.04a
≥ 20°C	105	0.00 ± 0.03a	145	0.09 ± 0.04b	106	0.07 ± 0.02b	135	0.05 ± 0.05b	125	-0.01 ± 0.13a	76	-0.01 ± 0.01a	72	0.09 ± 0.04b
Season														
December-February	46	-0.11 ± 0.05a	23	-0.02 ± 0.05a			14	-0.05 ± 0.04a	8	-0.18 ± 0.24a				
March - May	117	0.07 ± 0.03b	144	0.00 ± 0.04a	115	0.01 ± 0.02a	76	0.02 ± 0.02a	66	0.13 ± 0.13a	46	0.03 ± 0.01a	35	0.08 ± 0.02a
June - September	31	0.04 ± 0.05ab	29	0.02 ± 0.05a	63	-0.01 ± 0.02a	67	0.03 ± 0.03a	67	0.05 ± 0.14a	41	-0.03 ± 0.01b	39	-0.08 ± 0.02b
Regression on body weight		-0.0002 ± 0.0002		0.0002 ± 0.0002		-0.0002 ± 0.0001		0.0001 ± 0.0001		-0.0002 ± 0.0004		0.0000 ± 0.0000		0.0002 ± 0.0001
Afternoon body temperature														
General mean	194	39.45 ± 0.18	186	39.38 ± 0.09	157	39.36 ± 0.08	143	39.36 ± 0.04	133	39.42 ± 0.03	48	39.34 ± 0.04	72	39.41 ± 0.03
Sex:														
Male	94	0.06 ± 0.06 a	92	-0.02 ± 0.02a	83	-0.03 ± 0.02a	72	-0.02 ± 0.02a	63	-0.01 ± 0.01a	14	0.02 ± 0.02a	21	0.01 ± 0.01a
Female	100	-0.06 ± 0.06 a	94	0.02 ± 0.02a	74	0.03 ± 0.02a	71	0.02 ± 0.02a	70	0.01 ± 0.01a	34	-0.02 ± 0.02a	51	-0.01 ± 0.01a
Air temperature														
< 20°C	80	-0.23 ± 0.13a	36	-0.29 ± 0.05a										
20-29.9°C	95	0.17 ± 0.11b	111	0.00 ± 0.04b	122	-0.03 ± 0.03a	76	-0.05 ± 0.24a	70	0.06 ± 0.04a	17	-0.03 ± 0.02a	28	0.09 ± 0.02a
≥ 30°C	19	0.06 ± 0.20ab	39	0.29 ± 0.06c	35	0.03 ± 0.03a	67	0.05 ± 0.24a	63	-0.06 ± 0.04a	31	0.03 ± 0.02a	44	-0.09 ± 0.02b
Season														
December-February	46	-0.05 ± 0.13a	23	0.09 ± 0.07ab										
March - May	117	-0.01 ± 0.10a	134	0.05 ± 0.04a	94	-0.07 ± 0.02a	76	0.00 ± 0.24a	66	-0.07 ± 0.04a	27	0.00 ± 0.02a	33	-0.05 ± 0.02a
June - September	31	0.06 ± 0.17a	29	-0.14 ± 0.07b	63	0.07 ± 0.02b	67	-0.00 ± 0.24a	67	0.07 ± 0.04a	21	-0.00 ± 0.02a	39	0.05 ± 0.02b
Regression on body weight		0.0004 ± 0.0006		0.0002 ± 0.0002		-0.0001 ± 0.0002		-0.0000 ± 0.0002		-0.0002 ± 0.0001		0.0000 ± 0.0001		0.0000 ± 0.0001

Table (9): Least squares constants ± Standard errors of factors affecting body temperature in offspring of Grey Flander rabbits.

Classification	Weaning		6 weeks		8 weeks		10 weeks		12 weeks		14 weeks		16 weeks	
	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.
Morning body temperature														
General mean	100	39.18 ± 0.02	91	39.16 ± 0.02	77	39.12 ± 0.01	67	39.19 ± 0.03	61	39.21 ± 0.02	38	39.02 ± 0.02	28	38.88±0.22
Sex:														
Male	54	0.03 ± 0.02a	40	-0.05 ± 0.01a	34	0.01 ± 0.01a	29	0.00 ± 0.01a	26	-0.00 ± 0.00a	11	-0.01 ± 0.01a	5	0.02±0.08a
Female	46	-0.03 ± 0.02a	51	0.05 ± 0.01b	43	-0.01 ± 0.01a	38	-0.00 ± 0.01a	35	0.00 ± 0.00a	27	0.01 ± 0.01a	23	-0.02±0.08a
Air temperature														
< 20°C.	36	-0.03 ± 0.04a	24	-0.02 ± 0.04a	23	-0.04 ± 0.01a	9	0.03 ± 0.03a	8	0.03 ± 0.02a	13	-0.04 ± 0.01a	4	0.02±0.08a
≥ 20°C.	64	0.03 ± 0.04a	67	0.02 ± 0.04a	54	0.04 ± 0.01b	58	-0.03 ± 0.03a	53	-0.03 ± 0.02a	25	0.04 ± 0.01b	24	-0.02±0.08a
Season														
December-February	28	0.03 ± 0.05a	21	0.08 ± 0.06a			5	-0.07 ± 0.04a	5	-0.06 ± 0.02a				
March - May	54	0.00 ± 0.03a	53	-0.06 ± 0.03a	55	0.04 ± 0.01a	18	-0.03 ± 0.02a	15	-0.02 ± 0.01a	15	0.02 ± 0.01a	10	0.02±0.07a
June - September	18	-0.03 ± 0.04a	17	-0.02 ± 0.04a	22	-0.04 ± 0.01b	44	0.10 ± 0.03b	41	0.08 ± 0.02b	23	-0.02 ± 0.01b	18	-0.02±0.07a
Regression on: body weight		0.0001 ± 0.0003		0.0003 ± 0.0002		-0.0001 ± 0.0001		-0.0003 ± 0.0001		-0.0001 ± 0.0001		0.0002 ± 0.0000		0.0006±0.0003
Afternoon body temperature														
General mean	100	39.31 ± 0.01	91	39.26 ± 0.03	65	39.24 ± 0.08	62	39.29 ± 0.04	56	39.39 ± 0.04	34	39.05 ± 0.22	24	39.58±0.04
Sex:														
Male	46	-0.01 ± 0.02a	40	-0.00 ± 0.02a	27	-0.01 ± 0.03a	26	-0.02 ± 0.02a	23	-0.01 ± 0.01a	9	0.00 ± 0.05a	3	0.13±0.02a
Female	54	0.01 ± 0.02a	51	0.00 ± 0.02a	38	0.01 ± 0.03a	36	0.02 ± 0.02a	33	0.01 ± 0.01a	25	-0.00 ± 0.05a	21	-0.13±0.02b
Air temperature														
< 20°C.	34	-0.10 ± 0.06a	23	-0.25 ± 0.10a										
20-29.9°C.	52	0.05 ± 0.06b	36	0.09 ± 0.06b	47	-0.09 ± 0.07a	37	-0.03 ± 0.02a	22	-0.04 ± 0.02a	10	0.01 ± 0.05a	5	0.07±0.01a
≥ 30°C.	14	0.05 ± 0.08ab	32	0.16 ± 0.06b	18	0.09 ± 0.07a	25	0.03 ± 0.02a	34	0.04 ± 0.02b	24	-0.01 ± 0.06a	19	-0.07±0.01b
Season														
December-February	28	-0.02 ± 0.06a	21	0.21 ± 0.11a										
March - May	54	-0.04 ± 0.04a	53	-0.08 ± 0.06a	43	-0.01 ± 0.06a	18	-0.07 ± 0.02a	15	-0.08 ± 0.02a	11	-0.08 ± 0.06a	6	-0.12±0.01a
June - September	18	0.06 ± 0.07a	17	-0.13 ± 0.07a	22	0.01 ± 0.06a	44	0.07 ± 0.02b	41	0.08 ± 0.02b	23	0.08 ± 0.06a	18	0.12±0.01b
Regression on: body weight		0.0000 ± 0.0003		0.0002 ± 0.0003		0.0003 ± 0.0003		0.0000 ± 0.0002		-0.0002 ± 0.0001		0.0004 ± 0.0002		-0.0001±0.0000

temperature in morning and in afternoon showed that both males and females were nearly of similar body temperature at all comparable ages (Tables 5, 7 and 9). Sex differences were not significant at most ages in all breeds studied (Tables 6, 8 and 10). These results are in agreement with those reported by Abdel-Malek (1967) in Giza White rabbits, who found that body temperature was the same in both sexes.

Air temperature:

The morning air temperature was classified into two levels ($<20°C$ and 20-28°C), while afternoon air temperature was classified into three levels ($<20°C$, 20-$<30°C$. and 30-38°C). Results of the effect of air temperature (in the morning and in the afternoon) on body temperature of rabbits of the three breeds at the different ages studied showed in general a slight possitive association between air temperature and body temperature at the time of measurement (Tables 5,7 and 9). At each time of measurements, difference in body temperature due to air temperature was found to be significant ($P<0.05$ or <0.01) at most ages in all the breeds used (Tables 6, 8 and 10).

It is clear that body temperature is slightly increased with raising air temperature either in the morning or in the afternoon. This is because rabbits are homeothermic animals and thus they are always trying to keep their body temperature constant,inspite of flactuations in environmental temperature by increasing their respiration rate to get rid of the excess

Table (6): Least squares analysis of variance of factors affecting body temperature in offspring of Giza White rabbits.

Source of variation	Weaning			6 Weeks			8 Weeks			10 Weeks			14 Weeks			16 Weeks	
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance	d.f	Mean square	Variance %
Morning body temperature																		
Sex	1	0.0717	2.63	1	0.0129	0.00	1	0.045	4.35	1	0.0857 *	7.41	1	0.0356	0.00	1	0.0150	0.00
Air temperature	1	0.0731	2.63	1	0.0744	1.96	1	0.0231	0.00	1	0.0825 *	11.11	1	0.0071	0.00	1	0.0139	0.00
Season	2	0.2181 **	15.78	2	0.0060	0.00	2	0.0680 *	8.70	2	0.0581 *	7.41	1	0.0491	0.00	1	0.0154	0.00
Regression on body weight :	1	0.0010		1	0.0060		1	0.0011		1	0.1825 **		1	0.2453		1	0.2335 *	
Residual	115	0.0266	78.96	106	0.0531	98.04	97	0.0193	86.95	87	0.0172	74.07	46	0.0734	100.00	35	0.0363	100.00
Afternoon body temperature																		
Sex	1	0.0221	0.00	1	0.0600	0.00	1	0.0731 **	5.62	1	0.3021	5.38	1	0.2787 **	41.67	1	0.0011	0.00
Air temperature	2	0.2441 *	12.50	2	0.0746	0.83	1	0.1739 **	32.58	1	0.1354	8.60	1	0.1047 **	19.44	1	0.0022	0.00
Season	2	0.0155	0.00	2	0.0482	0.00	1	0.0366	5.62	1	0.0192	0.00	1	0.0722 *	11.11	1	0.0135	0.00
Regression on body weight :	1	0.0577		1	0.0455		1	0.0002		1	0.6241 **		1	0.0060		1	0.0014	
Residual	114	0.0663	87.50	105	0.0537	99.17	92	0.095	56.18	82	0.0831	86.02	45	0.0111	27.78	34	0.0308	100.00

Table (8): Least squares analysis of variance of factors affecting body temperature in offspring of Bauscat rabbits.

Source of variation	Weaning			6 weeks			8 weeks			10 weeks			12 weeks			14 weeks			16 weeks		
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
Morning body temperature																					
Sex	1	0.1021	0.10	1	0.0088	0.00	1	0.0043	0.00	1	0.0024	0.00	1	0.6155	0.41	1	0.0105	3.41	1	0.0067	0.00
Air temperature	1	0.0022	0.00	1	0.4681^{x}	12.50	1	0.4911^{xx}	13.79	1	0.0647^{x}	27.97	1	0.0017	0.00	1	0.0023	0.00	1	0.1614^{x}	24.07
Season	2	0.3895^{x}	7.11	2	0.0042	0.00	1	0.0127	0.00	2	0.0164	2.10	2	0.2674	0.00	1	0.0482^{xx}	22.87	1	0.3957^{xx}	20.37
Regression on body weight	1	0.0441		1	0.0420		1	0.1196		1	0.0168		1	0.1396		1	0.0009		1	0.0716	
Residual	188	0.0908	92.79	180	0.0733	87.50	173	0.0495	86.21	151	0.0149	69.93	135	0.4907	99.59	82	0.0038	73.72	73	0.0317	55.56
Afternoon body temperature																					
Sex	1	0.7594	0.24	1	0.1161	0.89	1	0.1686	1.12	1	0.0830	1.48	1	0.0182	0.00	1	0.0092	0.00	1	0.0080	0.00
Air temperature	2	2.8242^{x}	7.97	2	0.9251^{xx}	41.07	1	0.0861	0.45	1	0.0029	0.00	1	0.0484	1.47	1	0.0172	7.41	1	0.1779^{xx}	50.00
Season	2	0.0604	0.00	2	0.1399	4.47	1	0.5721^{xx}	8.84	1	0.0000	0.00	1	0.0733	25.00	1	0.0001	0.00	1	0.0589^{x}	16.67
Regression on body weight	1	0.2627		1	0.0865		1	0.0305		1	0.0022		1	0.1538^{xx}		1	0.0013		1	0.0000	
Residual	187	0.6086	91.79	179	0.0618	53.57	152	0.0748	78.39	138	0.0584	98.52	128	0.0210	73.53	43	0.0087	92.59	67	0.0121	33.33

Table (10): Least squares analysis of variance of factors affecting body temperature in offspring of Grey Flander rabbits.

Source of variance	Weaning			6 weeks			8 weeks			10 weeks			12 weeks			14 weeks			16 weeks		
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
Morning body temperature																					
Sex	1	0.0872	2.44	1	0.2210^{xx}	19.23	1	0.0106	0.00	1	0.0013	0.00	1	0.0000	0.00	1	0.0038	4.61	1	0.0027	0.00
Air temperature	1	0.0176	0.00	1	0.0031	0.00	1	0.0881^{xx}	23.53	1	0.0125	0.00	1	0.0066	25.00	1	0.0218^{xx}	54.89	1	0.0033	0.00
Season	2	0.0122	0.00	2	0.0375	3.85	1	0.0798^{xx}	17.65	2	0.0816^{xx}	37.50	2	0.0439^{xx}	50.00	1	0.0077^{x}	16.17	1	0.0056	0.00
Regression on body weight	1	0.0056		1	0.0468		1	0.0021		1	0.0507^{x}		1	0.0188^{xx}		1	0.0559^{xx}		1	0.2232	
Residual	94	0.0352	97.56	85	0.0169	76.92	72	0.0087	58.82	61	0.0082	62.50	55	0.0023	25.00	33	0.0011	24.33	23	0.0564	100.0
Afternoon body temperature																					
Sex	1	0.0145	0.00	1	0.0033	0.00	1	0.0079	0.00	1	0.0306	0.97	1	0.0016	0.00	1	0.0002	0.00	1	0.1085^{xx}	49.65
Air temperature	2	0.0909	9.09	2	0.1570^{x}	18.52	1	0.1028	9.09	1	0.0494	4.53	1	0.0412^{x}	9.10	1	0.0019	0.00	1	0.0387^{xx}	11.38
Season	2	0.0201	0.00	2	0.0815	7.41	1	0.0031	0.00	1	0.1657^{xx}	29.77	1	0.1193^{xx}	45.45	1	0.1040	12.28	1	0.0941^{xx}	37.03
Regression on body weight	2	0.0012		1	0.0118		1	0.0583		1	0.0004		1	0.0279		1	0.1221		1	0.0096^{x}	
Residual	93	0.0403	90.91	84	0.0409	74.07	60	0.0604	90.91	57	0.0154	64.73	51	0.0098	45.45	29	0.0474	87.72	19	0.0014	1.94

in body temperature.

In agreement with the present results, Johnson et al. (1957 & 1958) in NewZealand White rabbits and Hassanein (1980) in Giza White rabbits, reported that body temperature was increased within the sub-lethal temperature with raising air temperature.

Season:

Body temperature of the offspring of the three breeds at different ages from weaning to 16 weeks of age varied slightly with season of the year but did not show any consistent trend (Tables 5,7 and 9). Seasonal differences in body temperature of animals of each breed either in the morning or in the afternoon were found to be significant ($P < 0.05$ or $P < 0.01$) at some ages and non-significant at others (Tables 6,8 and 10). Body temperature of the offspring is expected to be higher in summer months than in winter months because of the higher air temperature in summer than in winter, but this was not realized at all ages studied.

Changes in body temperature of the offspring of this work caused by seasonal variation were observed to be small (Tables 5,7 and 9). Similar results were reported by Johnson et al. (1958) on NewZealand White rabbits, Abdel-Malek (1967) and Shafie et al. (1970) on Giza White

rabbits. Shafie et al. (1970) attributed the slight seasonal variation to that body temperature in rabbits is regulated by other physiological reactions which act to keep body temperature constant.

Body weight:

The effect of body weight on body temperature was studied in the form of linear regression (Tables 5, 7 and 9). Most values of the regression coefficients of body temperature on body weight at different ages in all breeds were either of very small negative magnitude or equal zero. Thus, body weight of the rabbit did not show any obvious effect on body temperature.

2. Respiration rate

The respiratory system in homeothermic animals is one of the most important systems by which the animal regulates the internal body temperature and induces its stability inspite of the fluctuations in the environmental temperature. Thus, the animal, through respiratory system, is able to change the rate of both heat production and dissipation at the same time. This is to maintain body temperature at a fairly stable value by increasing or decreasing water vaporization. Respiration rate, therefore, may be affected by body temperature and air temperature; beside some other physiological processes and surrounding environmental influences.

a) Respiration Rate in Does

Results presented in Table (11) show that the overall means of respiration rate in the morning were 143.2, 150.6 and 140.3 per minute in Giza White, Bauscat and Grey Flander does, respectively. The respective afternoon values were 150.9, 149.9 and 149.0 per minute. The afternoon records seem to be slightly higher than those of the morning. This may be attributed to the lower morning air temperatures than those of the afternoon (Table 2).

Table (11): Least squares constants ± standard errors of factors affecting respiration rate in does.

Classification	Giza White			Bauscat			Grey Flandar		
		Morning	Afternoon		Morning	Afternoon		Morning	Afternoon
	N	Const. ± S.E.	Const. ± S.E.	N	Const. ± S.E.	Const. ± S.E.	N	Const. ± S.E.	Const. ± S.E.
General mean	290	143.2 ± 1.0	150.9 ± 1.0	450	150.6 ± 2.3	149.9 ± 0.8	211	140.3 ± 1.0	149.0 ± 1.0
Month:									
October (21.7°C.)	35	-8.4 ± 2.0 ae	-9.1 ± 2.0 a	55	-23.1 ± 4.1 a	-15.5 ± 1.4 a	25	- 6.6 ± 2.2 a	-4.8 ± 2.2 ad
November(19.5°C.)	30	-15.8 ± 2.0 bd	-19.9 ± 2.0 bd	50	-30.9 ± 4.0 ab	-28.7 ± 1.4 b	25	-18.3 ± 2.1 bd	-24.0 ± 2.2 bc
December(14.6°C.)	26	-33.8 ± 2.1 c	-32.4 ± 2.0 c	42	-38.4 ± 4.2 b	-35.9 ± 1.4 c	20	-31.1 ± 2.2 c	-30.3 ± 2.3 c
January (12.5°C.)	26	-21.2 ± 2.1 d	-20.6 ± 2.1 b	42	-32.1 ± 4.3 ab	-24.0 ± 1.5 d	20	-18.9 ± 2.1 d	-25.2 ± 2.2 c
February (15.1°C.)	26	-12.6 ± 2.1 ab	-14.0 ± 2.0 ad	42	-23.0 ± 4.1 a	-15.5 ± 1.4 a	20	-8.5 ± 2.1 a	-9.8 ± 2.2 d
March (20.2° C.)	26	-1.8 ± 2.1 e	-1.1 ± 2.0 e	42	-2.1 ± 4.1 c	1.6 ± 1.4 e	20	-6.0 ± 2.3 a	-3.2 ± 2.3 a
April (24.5° C.)	30	8.0 ± 2.0 f	7.0 ± 1.9 f	48	9.3 ± 4.0 cd	11.4 ± 1.4 f	21	11.5 ± 2.2 e	11.3 ± 2.3 e
May (26.9° C.)	31	15.1 ± 2.0 g	15.0 ± 1.9 g	49	18.2 ± 4.0 de	19.9 ± 1.3 g	21	14.3 ± 2.1 eg	16.7 ± 2.2 eg
June (29.9°C.)	24	22.5 ± 2.2 h	24.2 ± 2.1 h	35	25.1 ± 4.4 e	27.6 ± 1.5 h	16	18.3 ± 2.4 gh	23.4 ± 2.5 gh
July (28.8 °C.)	24	22.1 ± 2.2 h	24.1 ± 2.1 h	30	28.5 ± 4.8 e	28.8 ± 1.6 h	16	22.2 ± 2.4 h	24.3 ± 2.4 h
August (29.5°C.)	12	25.9 ± 3.1 h	26.8 ± 2.9 h	15	68.5 ± 6.6 f	30.3 ± 2.3 h	7	23.1 ± 3.5 gh	21.7 ± 3.6 gh
Weight of doe									
≤ 2500 grams	139	-0.2 ± 0.8 a	-0.5 ± 0.7 a	183	1.7 ± 1.5 a	-0.2 ± 0.5 a	73	0.1 ± 0.8 a	0.5 ± 0.8 a
> 2500 grams	151	0.2 ± 0.8 a	0.5 ± 0.7 a	267	-1.7 ± 1.5 a	0.2 ± 0.5 a	138	-0.1 ± 0.8 a	-0.5 ± 0.8 a
Age of doe :									
8 - 12 months	84	0.3 ± 1.3 ab	0.0 ± 1.3 a	112	10.6 ± 2.6 a	3.6 ± 0.9 a	40	-0.2 ± 1.5 a	0.1 ± 1.5 a
> 12 - 24 months	128	-2.0 ± 1.0 a	-1.5 ± 0.9 a	229	-6.2 ± 2.0 bc	-0.4 ± 0.7 b	86	0.5 ± 1.2 a	0.4 ± 1.2 a
> 24 months	78	1.7 ± 1.1 b	1.5 ± 0.9 a	109	-4.4 ± 2.2 c	-3.2 ± 0.7 c	85	-0.3 ± 1.0 a	-0.5 ± 1.0 a
Reproductive status :									
Pregnancy	89	0.8 ± 0.9 a	1.1 ± 0.9 a	120	2.2 ± 1.8 a	-0.3 ± 0.6 a	66	2.4 ± 0.9 a	1.2 ± 0.9 a
No pregnancy	201	-0.8 ± 0.9 a	-1.1 ± 0.9 a	330	-2.2 ± 1.8 a	0.3 ± 0.6 a	145	-2.4 ± 0.9 b	-1.2 ± 0.9 a
Suckling status:									
Suckling	76	0.9 ± 1.0 a	1.1 ± 0.9 a	112	4.7 ± 1.8 a	-0.4 ± 0.6 a	60	-0.7 ± 0.8 a	-0.9 ± 0.9 a
No suckling	214	-0.9 ± 1.0 a	-1.1 ± 0.9 a	338	-4.7 ± 1.8 b	0.4 ± 0.6 a	151	0.7 ± 0.8 a	0.9 ± 0.9 a

Month:

Respiration rate in the morning and in the afternoon varied significantly ($P < 0.01$) with months of the year (Tables 11 and 12). Respiration rate in the morning and in the afternoon, respectively, averaged 166.9 and 170.8 per minute during summer months (April-September) and 126.2 and 132.6 per minute during winter months (October-March). These information indicate that respiration rate during summer months exceeded respiration rate during winter months by 40.7 per minute in the morning and 38.2 per minute in the afternoon. Seasonal variation in respiration rate may be attributed to seasonal differences in both air and body temperatures, the average air and body temperatures, respectively, were 27.89 and 39.64°C. in summer and 17.06 and 39.03°C in winter.

Johnson *et al.* (1958) in New Zealand White rabbits, Abdel-Malek (1967) and Shafie *et al.* (1970) in Giza White rabbits found that respiration rate was greatly affected by monthly changes in air temperature and the maximum values of respiration rate were observed during summer months (June-August). These results appear to be in agreement with those obtained in this work.

Body weight:

Results presented in Table 11 and 12 show that,

Table (12) : Least squares analysis of variance of factors affecting respiration rate in does.

Source of Variation	Giza White					Bauscat					Grey Flander				
		Morning		Afternoon			Morning		Afternoon			Morning		Afternoon	
	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %
Month	10	6926.10**	70.43	7309.80**	73.06	10	24099.86**	43.43	16416.11**	82.03	10	4647.89**	70.90	5909.90**	76.58
Weight of doe	1	6.98	0.00	50.90	0.00	1	938.58	0.08	10.03	0.00	1	2.84	0.00	38.61	0.00
Age of doe	2	319.89	0.77	193.48	0.32	2	6555.65**	3.79	965.46**	1.60	2	11.10	0.00	15.80	0.00
Reproductive status	1	82.26	0.00	179.44	0.24	1	1145.70	0.24	23.25	0.00	1	712.89**	2.79	161.85	0.24
Suckling status	1	103.90	0.00	155.77	0.19	1	4835.50*	2.51	34.37	0.00	1	56.93	0.00	99.28	0.00
Residual	274	115.71	28.80	107.31	26.19	434	735.79	49.95	86.56	16.37	195	96.33	26.31	100.30	23.18

for the three breeds of the study, weight of doe did not exhibit any significant effect on its respiration rate either in the morning or in the afternoon. But, when considering does of all these breeds together, respiration rate for does of $\leq$ 2500 grams weight was nearly the same as that for does of $>$ 2500 grams weight in the morning (145.2 and 144.2 per minute,respectively) and in the afternoon (149.9 and 150.0 per minute, respectively). All these observations show that the effect of doe's weight was a negligible source of variation in its respiration rate.

Age of doe:

Respiration rate of the doe in the morning and in the afternoon tended to decreased slightly with advance in age. The averages of respiration rate for does of 8-12, $>$ 12—24 and $>$ 24 months old, respectively, were 148.3, 142.1 and 143.7 per minute in the morning and 151.2, 149.4 and 149.0 per minute in the afternoon (Table 11). Differences in respiration rate in the morning and in the afternoon due to age of doe were highly significant ($P < 0.01$) in Bauscat does and non-significant in both Giza White and Grey Flander does (Table 12). Results of this study on Bauscat does are in line with those reported on Giza White rabbits by Abdel-Malek (1967) and Hassanein (1980) who showed that

the effect of age on respiration rate was highly significant ($P < 0.01$). The latter author stated that the increase in respiration rate in young does may be attributed to irritability and restlessnes with the experiance of pregnancy.

Reproductive status:

Respiration rates of pregnant does were 146.5 and 150.6 per minute in the morning and in the afternoon, respectively. The respective values of non-pregnant ones were 142.9 and 149.3 per minute (Table 11). The statistical analysis showed that reproductive status had no significant effect on respiration rate of does of all breeds except for Grey Flander in the morning (Table 12). Previous studies of Abdel-Malek (1967) and Hassanein (1980) on Giza White rabbits showed, however, higher respiration rate for non-pregnant does than for pregnant ones, the differences being highly significant ($P < 0.01$). This seems to be in disagreement with the present results in general.

Suckling status:

Respiration rate of suckling does of all breeds averaged 146.2 and 150.0 per minute in the morning and in the afternoon, respectively. The respective values were 143.1 and 150.0 per minute for the non-suckling

does (Table 11). Coupling those findings with these of the analysis of variance presented in Table 12, it could be noted that the differences in respiration rate between suckling and non-suckling does were either very limited or null and in most cases they were non-significant. Similar results were obtained by Hassanein (1980) who reported that suckling status had no significant effect on respiration rate.

b) Respiration Rate in Offspring

The overall means of respiration rate in the morning and in the afternoon calculated for the offspring of Giza White, Bauscat and Grey Flander rabbits at different ages are presented in Tables 13, 15 and 17, respectively. These means showed that no considrable differences was detected between breeds in either morning or afternoon offspring respiration rate at any of the different ages studied. Also, results of the same tables, did not show any consistent trend for the change in respiration rate with age changes.

The averages of the means of respiration rate at all ages of Giza White, Bauscat and Grey Flander offspring, respectively, were 164.8, 163.6 and 163.0 per minute in the morning; and 187.6, 188.8 and 183.0 per minute in the afternoon. These averages reveal that the afternoon respiration rate was higher than the morning respiration rate by 23, 25 and 20 per minute in Giza White, Bauscat and Grey Flander rabbits, respectively. The same trend was observed when considering doe's respiration rate. This trend may be attributed to the higher afternoon air temperature than those of morning (Table 2).

Sex:

Constants of sex effects give evidence that both

Table (13): Least squares constants ± Standard errors of factors affecting respiration rate in offspring of Giza White rabbits.

Classification	Weaning		6 weeks		8 weeks		10 weeks		14 weeks		16 weeks	
	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.
Morning respiration rate												
General mean	121	167.9 ± 1.2	112	162.0 ± 1.5	103	166.9 ± 2.8	93	160.7 ± 2.8	51	172.3 ± 3.1	40	158.8 ± 5.1
Sex:												
Male	56	0.6 ± 0.8a	51	-0.9 ± 1.3a	45	0.3 ± 1.4a	42	0.2 ± 1.1a	16	-0.5 ± 1.0a	11	0.4 ± 1.5a
Female	65	-0.6 ± 0.8a	61	0.9 ± 1.3a	58	-0.3 ± 1.4a	51	-0.2 ± 1.1a	35	0.5 ± 1.0a	29	-0.4 ± 1.5a
Air temperature												
< 20°C.	48	-14.0 ± 1.1a	19	-8.5 ± 2.1a	14	-6.4 ± 2.4a	14	-3.1 ± 1.7a	3	-7.9 ± 2.0a	1	-14.7 ± 4.2a
≥ 20°C.	73	14.0 ± 1.1b	93	8.5 ± 2.1b	89	6.4 ± 2.4b	79	3.1 ± 1.7a	48	7.9 ± 2.0b	39	14.7 ± 4.2b
Season												
December-February	25	-0.5 ± 1.8a	15	-8.2 ± 3.1a	10	-11.8 ± 3.7a	2	-14.7 ± 5.3a				
March - May	67	-0.4 ± 1.1a	73	-1.0 ± 2.0a	70	4.3 ± 2.2a	51	-1.0 ± 2.8a	24	-0.6 ± 0.9a	18	--2.4 ± 1.3a
June - Septemper	29	0.9 ± 1.5a	24	9.2 ± 2.4b	23	16.1 ± 3.0b	40	15.7 ± 3.1b	27	0.6 ± 0.9a	22	2.4 ± 1.3a
Regression on body weight		-0.0185 ± 0.0078		-0.0026 ± 0.0085		-0.0052 ± 0.0117		0.0045 ± 0.0071		-0.0058 ± 0.0044		0.0045 ± 0.0049
Afternoon respiration rate												
General mean	121	188.5 ± 2.6	112	177.3 ± 2.0	97	196.3 ± 3.7	87	185.5 ± 2.5	50	197.2 ± 4.4	39	180.6 ± 10.1
Sex:												
Male	56	-1.4 ± 1.7a	51	-2.8 ± 2.0a	41	2.4 ± 2.2a	38	0.7 ± 1.9a	15	0.7 ± 1.7a	10	3.2 ± 3.9a
Female	65	1.4 ± 1.7a	61	2.8 ± 2.0a	56	-2.4 ± 2.2a	49	-0.7 ± 1.7a	35	-0.7 ± 1.7a	29	-3.2 ± 3.9a
Air temperature												
< 20°C.	41	- 43.0 ± 5.1a	17	-18.0 ± 5.0a								
20-29.9°C.	54	-0.9 ± 4.5b	60	-2.9 ± 3.2b	63	-10.7 ± 2.9a	47	-2.9 ± 4.6a	15	0.9 ± 2.1a	12	-2.7 ± 4.2a
≥ 30°C.	26	43.9 ± 8.1c	35	20.9 ± 4.4c	34	10.7 ± 2.9b	40	2.9 ± 4.6a	35	-0.9 ± 2.1a	27	2.7 ± 4.2a
Season												
December-February	25	11.4 ± 5.2a	15	-5.9 ± 5.4a								
March - May	67	13.5 ± 4.5a	23	4.1 ± 3.3a	74	-12.4 ± 3.3a	47	-14.5 ± 4.6a	23	-4.3 ± 1.8a	17	-5.7 ± 3.9a
June - September	29	-24.9 ± 7.9b	24	1.8 ± 5.0a	23	12.4 ± 3.3b	40	14.5 ± 4.6b	27	4.3 ± 1.8b	22	5.7 ± 3.9a
Regression on: body weight		-0.0531 ± 0.0181		0.0046 ± 0.0124		0.0193 ± 0.0174		0.0147 ± 0.0122		-0.0063 ± 0.0078		0.0190 ± 0.0129

Table (15): Least squares constants ± standard errors of factors affecting respiration rate in offspring of Bauscat rabbits.

Classification	Weaning		6 weeks		8 weeks		10 weeks		12 weeks		14 weeks		16 weeks	
	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.
Morning respiration rate														
General mean	194	162.9±1.9	186	163.9±4.9	178	160.8±3.0	157	162.8±1.2	141	162.2±2.0	87	167.6±1.0	78	165.3±2.5
Sex:														
Male	94	-0.4±0.6 a	92	1.2±1.5 a	88	0.1±0.9 a	75	-0.2±0.8 a	66	-0.0±1.2 a	29	0.4±1.1 a	23	-1.1±1.1 a
Female	100	0.4±0.6 a	94	-1.2±1.5 a	90	-0.1±0.9 a	82	0.2±0.8 a	75	0.0±1.2 a	58	-0.4±1.1 a	55	1.1±1.1 a
Air temperature														
< 20°C.	89	-9.5±0.8 a	41	-11.7±2.5 a	72	-10.8±1.1 a	22	-5.8±1.7 a	16	-6.1+2.7 a	11	-8.3±1.7 a	6	-10.1±1.9 a
≥ 20°C.	105	9.5±0.8 b	145	11.7±2.5 b	106	10.8±1.1 b	135	5.8±1.7 b	125	6.1±2.7 b	76	8.3±1.7 b	72	10.1±1.9 b
Season														
December-February	46	-8.5±1.3 a	23	-1.5±4.5ab			14	-9.8±2.8 a	8	-15.8±4.7 a				
March-May	117	-1.0±0.8 b	134	-4.8±2.5a	115	-3.7±1.2 a	76	-3.7±1.5 a	66	-2.3±2.5 a	46	-3.9±1.4 a	39	0.5±1.1 a
June-September	31	9.5±1.4 c	29	6.3±3.5b	63	3.7±1.2 b	67	13.5±1.7 b	67	18.1±2.6 b	41	3.9±1.4 b	39	-0.5±1.1 a
Regression on body weight		-0.0141±0.0062		-0.0031±0.0146		-0.0166±0.0077		0.0019±0.0054		-0.0078±0.0071		0.0035±0.0058		0.0008±0.0053
Afternoon respiration rate														
General mean	194	179.0 + 3.5	186	185.0+8.6	157	193.0+6.8	143	190.1+3.1	133	194.4+5.4	78	188.0+2.8	72	192.2+4.8
Sex :														
Male	94	0.1+1.1 a	92	-0.2+1.8 a	83	-1.6+1.9 a	72	-2.0+1.4 a	63	0.8+2.2 a	24	2.8+2.2 a	21	0.4+2.2 a
Female	100	-0.1+1.1 a	94	0.2+1.8 a	74	1.6+1.9 a	71	2.0+1.4 a	70	-0.8+2.2 a	54	-2.8+2.2 a	51	-0.4+2.2 a
Air temperature														
< 20° C.	80	-12.5+2.6 a	36	-32.6+5.2 a										
20 - 29.9°C.	95	18.4+2.1 b	111	-4.8+3.7 b	122	-5.4+2.4 a	76	-18.7+16.9 a	70	-5.8+6.6 a	16	-6.7+3.0 a	28	2.6+3.5 a
≥ 30 °C.	19	-5.9+3.9 a	39	37.4+5.4 c	35	5.4+2.4 b	67	18.7+16.9 a	63	5.8+6.6 a	62	6.7+3.0 b	44	-2.6+3.5 a
Season:														
December-February	46	-20.5+2.5 a	23	2.2+6.3 a										
March - May	117	-5.6+1.9 b	134	2.5+4.1 a	94	-17.0+2.1 a	76	-0.0+16.8 a	66	-14.2+6.6 a	37	-2.5+2.4 a	33	-0.5+3.5 a
June - September	31	26.1+3.3 c	29	-4.7+6.3 a	63	17.0+2.1 b	67	0.0+16.8 a	67	14.2+6.6 b	41	2.5+2.4 a	39	0.5+3.5 a
Regression on body weight:		-0.0129+0.0114		-0.0023+0.0177		-0.0125+0.0182		-0.0078+0.0108		-0.0222+0.0138		0.0147+0.0116		0.0051+0.0113

Table (17): Least squares constants ± standard errors of factors affecting respiration rate in offspring of Grey Flander rabbits.

Classification	WEANING		6 WEEKS		8 WEEKS		10 WEEKS		12 WEEKS		14 WEEKS		16 WEEKS	
	N	Const.±S.E.	N	Const.± S.E.	N	Const. ± S.E.	N	Const. ±S. E.	N	Const.±S.E.	N	Const. ±S. E.	N	Const.±S.E.
Morning respiration rate														
General mean	100	164.1±0.7	91	160.5±1.5	77	163.0±1.0	67	157.1±2.9	61	167.5±4.2	38	173.1±5.4	28	155.5±5.5
Sex :														
Male	54	0.5±0.7 a	40	-1.3±1.0 a	34	0.2±0.9 a	29	0.9±1.2 a	26	0.6±1.5 a	11	1.9±1.6 a	5	0.3±1.9 a
Female	46	-0.5±0.7 a	51	1.3±1.0 a	43	-0.2±0.9 a	38	-0.9±1.2 a	35	-0.6±1.5 a	27	-1.9±1.6 a	23	-0.3±1.9 a
Air temperature:														
< 20° C.	36	-10.8±1.4 a	24	-12.6±2.8 a	23	-12 .3±1.2 a	9	0.8±2.6 a	8	-6.8±3.7 a	13	-8.3±2.0a	4	-14.3±1.9 a
≥ 20° C.	64	10.8±1.4 b	67	12.6±2.8 b	54	12.3±1.2 b	58	-0.8±2.6 a	53	6.8±3.7 a	25	8.3±2.0 b	24	14.3±1.9 b
Season:														
December-February	28	-1.2±2.0 a	21	-0.6±4.1 a			5	-15.3 ±4.3 a	5	-4.2±5.5 ab				
March - May	54	-0.8±1.2 a	53	-2.2±2.2 a	55	-1.1±1.2 a	18	- 7.3±2.3a	15	-8.1±2.9 a	15	0.0±2.0 a	10	0.4±1.8 a
June - September	18	2.0±1.6 a	17	2.8±2.6 a	22	1.1±1.2 a	44	22.6±2.9 b	41	10.3±3.7 b	23	-0.0±2.0 a	18	- 0.4±1.8 a
Regression on body weight:		0.0032±0.0111		0.0079±0.0139		-0.00184±0.0105		-0.0020±0.0117		-0.0169±0.0117		-0.0041±0.0087		0.0067±0.0070
Afternoon respiration rate														
General mean	100	179.0±0.6	91	175±6±1.9	65	185.2±5.6	62	176.4±3.3	56	193.7±6.7	34	196.3±6.3	24	174.7±7.2
Sex:														
Male	46	-0.4±1.1 a	40	-2.4±1.4 a	27	-2.2±2.3 a	26	-0.1±1.2 a	23	0.3±2.2 a	9	-2.3±1.8 a	3	2.1±3.0 a
Female	54	0.4±1.1 a	51	2.4±1.4 a	38	2.2±2.3 a	36	0.1±1.2 a	33	-0.3±2.2 a	25	2.3±1.8 a	21	-2.1±3.0 a
Air temperature:														
< 20° C.	34	-16.6±3.2 a	23	-25.0±6.6 a										
20 - 29.9°C.	52	12.4±2.4 b	36	10.5±3.8 b	47	2.9±5.1 a	37	-1.7±1.4 a	22	-3.5±3.1 a	10	-5.5±2.3 a	5	-5.6±2.5 a
≥ 30 °C.	14	4.2±4.3 b	32	14.5±4.0 b	18	-2.9±5.1 a	25	1.7±1.4 a	34	3.5±3.1 a	24	5.5±2.3 b	19	5.6±2.5 b
Season :														
December-February	28	-7.6±3.2 a	21	2.1±7.1 a										
March - May	54	-0.4±2.3 ab	53	-1.3±3.8 a	43	-7.0±4.8 a	18	-18.5±1.5 a	15	-9.0±3.6 a	11	2.6±2.2 a	6	5.5±2.8 a
June - September	18	8.0±4.0 b	17	-0.8±4.7 a	22	7.0±4.8 a	44	18.5±1.5 b	41	9.0±3.6 b	23	-2.6±2.2 a	18	-5.5±2.8 a
Regression on body weight :		-0.0137±0.0172		0.0125±0.0204		-0.0074±0.0252		-0.0039±0.0116		-0.0218±0.0187		-0.0090±0.0094		0.0190±0.0089

males and females of each breed had recorded nearly the same respiration rate either in the morning or in the afternoon at all ages studied (Tables 13,15 and 17). The same trend was found when considering males and females of all breeds, the averages of the means of respiration rate for males and females, respectively were 163.9 and 163.6 per minute in the morning and 186.4 and 186.5 per minute in the afternoon. The differences between the two sexes in all cases were statistically non-significant (Tables 14,16 and 18).

Johnson et al. (1957& 1958) in Newzealand white rabbits and Abdel-Malek (1967) in Giza white rabbits, however,found that respiration rate of males was lower than that of females .

Air temperature :

Results on the effects of air temperature in the morning and in the afternoon at different ages within breeds showed a general trend indicating the increase in respiration rate with the increase of air temperature (Tables13, 15 and 17). The effect of air temperature on both morning and afternoon respiration rates was found to be highly significant ($p < 0.01$) at most ages (Tables 14,16 and 18). The averages of the means of respiration rate in rabbits of all breeds at all ages studied (5-16 weeks) also showed a rise in respiration rate with the rise of air temperature either in the morning or in the afternoon. This is because respiration rate for rabbits

Table (14): Least squares analysis of variance of factors affecting respiration rate in offspring of Giza White rabbits.

Source of variation	Weaning			6 weeks			8 weeks			10 weeks			14 weeks			16 weeks		
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
								Morning respiration rate										
Sex	1	42.12	0.00	1	94.21	0.00	1	10.86	0.00	1	4.33	0.00	1	10.76	0.00	1	3.54	0.00
Air temperature	1	12734.06**	83.46	1	22975.57**	38.08	1	1463.30**	16.68	1	346.18	5.16	1	636.97**	74.29	1	736.10**	85.22
Season	2	16.34	0.00	2	1336.86**	13.09	2	3398.23**	35.02	2	2784.19**	52.72	1	16.50	0.00	1	207.77	1.73
Regression on body weight	1	438.59*		1	16.40		1	40.24		1	43.36		1	69.20		1	49.38	
Residual	115	76.70	16.54	106	174.92	48.83	97	203.41	48.10	87	106.39	42.12	46	40.83	25.71	35	60.49	13.05
								Afternoon respiration rate										
Sex	1	223.82	0.00	1	895.33	1.28	1	545.98	0.20	1	43.00	0.00	1	17.85	0.00	1	267.6	0.00
Air temperature	2	15694.79**	66.32	2	4881.77**	33.98	1	6313.73**	22.14	1	122.77	0.00	1	21.62	0.00	1	163.0	0.00
Season	2	1987.75**	8.23	2	410.98	0.00	1	6566.87**	29.99	1	3055.48**	55.37	1	603.25*	21.08	1	830.7	8.01
Regression on body weight	1	3156.86**		1	49.86		1	567.68		1	441.23		1	72.72		1	856.1	
Residual	114	366.70	25.45	105	428.60	64.74	92	458.34	47.57	82	306.73	44.63	45	110.82	78.92	34	395.1	91.99

Table (16): Least square analysis of variance of factors affecting respiration rate in off-spring Bauscat rabbits.

Source of variation	Weaning			6 weeks			8 weeks			10 weeks			12 weeks			14 weeks			16 weeks	
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
Morning respiration rate																					
Sex	1	25.82	0.00	1	235.98	0.00	1	1.19	0.00	1	5.81	0.00	1	0.06	0.00	1	11.34	0.00	1	84.41	0.13
Air temperature	1	9849.52**	64.32	1	8103.66**	31.82	1	12415.04**	59.43	1	937.67**	22.00	1	1020.16*	13.80	1	2244.11**	50.95	1	2067.38**	72.75
Season	2	1719.03**	10.71	2	1456.20*	5.55	1	1265.37**	6.20	2	4925.57**	47.38	2	6699.86**	43.07	1	1130.56**	10.67	1	17.20	0.00
Regression on body weight	1	362.98*		1	17.05		1	625.84*		1	10.95		1	235.26		1	36.82		1	1.86	
Residual	188	70.21	24.97	180	381.86	62.63	173	134.09	34.37	151	85.21	30.62	135	190.84	43.13	82	98.59	38.38	73	73.15	27.12
Afternoon respiration rate																					
Sex	1	2.15	0.00	1	10.03	0.00	1	380.47	0.00	1	547.27	0.89	1	96.02	0.00	1	509.44	1.59	1	8.02	0.00
Air temperature	2	18507.59**	48.17	2	13672.48**	55.76	1	2832.85*	4.11	1	348.76	31.67	1	505.67	0.00	1	1602.17*	18.77	1	148.74	0.00
Season	2	8419.09**	25.68	2	193.25	0.00	1	36656.82**	49.00	1	0.00	0.00	1	3041.70*	32.90	1	345.16	0.41	1	4.89	0.00
Regression on body weight	1	301.13		1	9.11		1	259.50		1	145.15		1	3589.65*		1	500.69		1	54.83	
Residual	187	237.88	26.15	179	545.89	44.24	152	547.70	46.89	138	282.87	67.44	128	651.13	67.10	73	308.89	79.23	67	271.55	100.00

Table (18) : Least squares analysis of variance of factors affecting respiration rate in offspring of Grey Flanier rabbits.

Source of variation	Weaning			6 weeks			8 weeks			10 weeks			12 weeks			14 weeks			16 weeks	
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
								Morning respiration rate												
Sex	1	21.99	0.00	1	138.93	0.33	1	2.48	0.00	1	48.56	0.00	1	20.83	0.00	1	93.35	0.89	1	1.12	0.00
Air temperature	1	3131.13**	82.07	1	1715.56**	76.89	1	6597.24**	81.89	1	7.57	0.00	1	401.05	23.24	1	1149.01**	64.38	1	1956.10**	91.82
Season	2	51.25	0.00	2	166.20	1.41	1	60.01	0.00	2	4441.66**	80.89	2	1147.82**	35.14	1	0.04	0.00	1	2.05	0.00
Regression on body weight	1	4.20		1	40.78		1	203.22		1	2.36		1	242.21		1	15.47		1	32.82	
Residual	94	50.43	17.83	85	83.38	21.37	72	66.42	18.11	61	84.26	19.11	55	116.55	41.62	33	69.80	34.73	23	35.73	8.18
								Afternoon respiration rate												
Sex	1	12.74	0.00	1	517.22	2.65	1	290.16	0.00	1	0.93	0.00	1	6.20	0.00	1	122.05	3.18	1	27.54	0.00
Air temperature	2	3681.17**	68.86	2	1347.59**	33.85	1	108.41	0.00	1	119.08	0.24	1	336.96	1.25	1	414.55*	37.58	1	282.93*	33.16
Season	2	348.09	4.42	2	11.23	0.00	1	686.80	13.19	1	11992.31**	89.27	1	1720.75*	33.55	1	102.29	2.88	1	213.48	30.17
Regression on body weight	1	76.08		1	68.23		1	28.34		1	8.87		1	363.02		1	67.65		1	253.96*	
Residual	93	119.70	26.72	84	181.82	63.50	60	330.52	86.81	57	80.18	10.49	51	267.00	65.20	29	74.41	56.36	19	55.32	36.67

under air temperature of 20°C and 20-28°C in the morning averaged 154.4 and 173.6 per minute, respectively, and that for rabbits under air temperature of 30 and 30-38°C in the afternoon averaged 180.2 and 195.6 per minute,respectively. The differences being 19.2 per minute in the morning and 15.3 per minute in the afternoon. Therefore, one may consider that air temperature is an important factor which affect respiration rate in such a way that when air temperature increased heat dissipation, through respiratory system will be higher than other physiological processes. Thus, respiratory system can be considered a major mean by which the animal react physiologically due to variation in the environmental air temperature to keep body temperature within the normal limits.

The increase of respiration rate with the increase of air temperature observed in this study was also noticed by Johnson et al. (1957 & 1958) in New Zealand White rabbits, Abdel-Malek (1967) and Hassanein (1980) in Giza White rabbits.

The calculated averages of the means of respiration rate for the three breeds in the morning were found to range from 152.8 to 155.3 per minute under $< 20°C$ and from 172.2 to 176.2 per minute under $\geq 20°C$. The respective averages of the afternoon ranged from 179.6 to 181.4 per minute under $< 30°C$ and from 187.6 to 200.9

per minute under $\geqslant$ 30°C. These information show that all breeds recorded in general nearly the same respiration rate within classes of air temperature and within time of measurement. This calls to note that effect of air temperature on respiration rate of rabbits of 5-16 weeks of age did not differ from breed to another.

Season:

Months from December to May were considered as winter months, while those from June to September were taken as summer months. Data presented in Tables 13, 15 and 17 showed that respiration rate in the morning or in the afternoon in summer months were generally higher than in winter months. Differences in respiration rate due to season of year were significant ($P < 0.05$ or < 0.01) at most ages in the three breeds (Tables 14, 16 and 18). The averages of the means of the morning respiration rate (of rabbits in all ages) during winter and summer months, respectively, were 161.0 and 175.6 per minute for Giza White rabbits , 158.4 and 171.4 per minute for Bauscat rabbits and 159.2 and 168.5 per minute for Grey Flander rabbits. In the afternoon, the corresponding estimates were 184.7 and 189.9 per minute for Giza White, 181.1 and 196.7 for Bauscat and 175.8 and 187.9 per minute for Grey Flander. These averages show that respiration

rate in winter was always lower than in summer either in the morning or in the afternoon. This trend can be attributed to higher air temperatures during summer months (28.23 - 29.98°C) than during winter months (12.53 - 26.89°C) as presented in Table 2). This trend agree well with that reported on New Zealand White rabbits by Johnson *et al.* (1958) and on Giza White rabbits by Abdel-Malek (1967) and Shafie *et al.* (1970).

Body weight:

Constants of the regression of respiration rate on body weight of the rabbit showed a poor negative association between the two variables at most ages of the three breeds (Tables 13;15 and 17). No singificant effect was observed for the effect of weight of rabbits on its respiration rate in the three breeds except at 5 weeks of age in Giza White rabbits in the morning and in the afternoon as well as at 5 and 8 weeks of age in the morning only in Bauscat rabbits (Tables 14, 16 and 18). These results show that weight of rabbit was not a pronounced factor influencing respiration rate.

B. LITTER TRAITS

The overall means of Litter Size at birth were 5.7, 6.0 and 7.4 young in Giza White, Bauscat and Grey Flander rabbits, respectively. The respective averages of litter weight at birth were 270.7, 294.3 and 315.3 grams (Table 19). It is clear, then, that Giza White recorded the lowest values for litter size and litter weight at birth, while Grey Flander recorded the highest respective values.

Body temperature of doe:

A trial was made to study the effect of body temperature of doe during pregnancy on litter size and litter weight at birth. Body temperature of does was therefore, recorded at early and late stages of pregnancy and was classified into < 39 and $\geq 39°C$ within each of these two stages. It was found that litters produced from does of body temperature of < 39 and $\geq 39°C$ were generally not significantly different in either size or weight at birth within each stage of pregnancy and within breed (Tables 19 and 20).

These results showed that effects of body temperature of the doe either in early or in late pregnency were not evident on both litter size and litter weight of the rabbits studied.

Table (19) : Least squares constants ± standard errors of litter size and litter weight at birth as affected by body temperature and respiration rate.

Classification	Giza White			Baumcat			Grey Flander		
		Litter size	Litter weight		Litter size	Litter weight		Litter size	Litter weight
	N	Const. ± S.E.	Const. ± S. E.	N	Const. ± S. E.	Const. ± S.E.	N	Const. ± S.E.	Const. ± S.E.
General mean	39	5.7 ± 0.4	270.7 ± 17.0	57	6.0 ± 0.4	294.3 ± 16.1	29	7.4 ± 0.5	315.3 ± 19.8
Body temperature at early pregnancy:									
< 39 °C.	19	0.1 ± 0.4 a	6.8 ± 17.5 a	13	-0.0 ± 0.3 a	1.4 ± 14.2 a	9	0.4 ± 0.4 a	20.7 ± 17.5 a
⩾ 39 °C.	20	-0.1 ± 0.4 a	-6.8 ± 17.5 a	44	0.0 ± 0.3 a	-1.4 ± 14.2 a	20	-0.4 ± 0.4 a	-20.7 ± 17.5 a
Body temperature at late pregnancy :									
< 39 °C.	14	-0.6 ± 0.5 a	-31.0 ± 22.7 a	12	-0.3 ± 0.3 a	1.7 ± 14.4 a	10	0.6 ± 0.4 a	41.7 ± 18.5 a
⩾ 39 °C.	25	0.6 ± 0.5 a	31.0 ± 22.7 a	45	0.3 ± 0.3 a	-1.7 ± 14.4 a	19	-0.6 ± 0.4 a	-41.7 ± 18.5 b
Respiration rate at early pregnancy :									
100-119 minute.	6	0.7 ± 0.9 a	58.9 ± 42.5 a	17	1.3 ± 0.6 a	85.6 ± 28.7 a	3	0.3 ± 1.1 a	22.3 ± 46.2 a
120-139 / minute.	11	-0.5 ± 0.8 a	2.3 ± 37.7 a	9	0.7 ± 0.6 ab	24.6 ± 26.7 ab	7	0.0 ± 0.8 a	80.8 ± 34.6 a
140-159 / minute.	11	0.1 ± 0.7 a	-4.1 ± 32.9 a	20	-0.6 ± 0.5 ab	-22.0 ± 20.6 b	12	-0.9 ± 0.7 a	-30.7 ± 27.9 a
⩾ 160 / minute	11	-0.3 ± 1.0 a	-57.1 ± 46.0 a	11	-1.4 ± 0.7 b	-88.2 ± 33.3 b	7	0.6 ± 1.1 a	-72.4 ± 45.9 a
Respiration rate at late pregnancy:									
100-119 / minute.	4	0.1 ± 0.9 a	-19.7 ± 41.3 a	8	-0.9 ± 0.7 ab	-71.1 ± 30.7 a	2	-2.1 ± 1.3 a	-116.8 ± 53.9 a
120-139 / minute.	11	0.5 ± 0.9 a	29.5 ± 43.2 a	19	-1.1 ± 0.5 a	-45.7 ± 23.8 a	8	-0.5 ± 0.7 a	-29.2 ± 31.5 ab
140-159 / minute.	11	-0.2 ± 0.7 a	-12.6 ± 31.7 a	12	1.1 ± 0.5 b	69.2 ± 24.6 b	12	0.4 ± 0.7 a	29.6 ± 29.1 ab
⩾ 160 / minute.	13	-0.4 ± 1.0 a	2.8 ± 45.0 a	18	0.9 ± 0.7 ab	47.6 ± 31.2 ab	7	2.2 ± 1.1 a	116.4 ± 47.6 b

Table (20) : Least squares analysis of variance litter size and litter weight at birth as affected by body temperature and respiration rate.

Source of variation	Giza White					Bauscats					Grey Flander				
		Litter size		Litter weight			Litter size		Litter weight			Litter size		Litter weight	
	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %	d.f	Mean square	Variance %	Mean square	Variance %
Body temperature at early pregnancy:	1	0.59	0.00	1272.59	0.00	1	0.00	0.00	58.28	0.00	1	3.50	0.78	8178.77	2.17
Body temperature at late pregnancy:	1	5.82	5.21	15639.28	9.65	1	1.91	0.00	82.68	0.00	1	6.72	10.59	29780.48*	24.26
Respiration rate at early pregnancy :	3	1.85	0.00	8227.63	0.00	3	4.94	7.96	18441.67*	18.47	3	2.93	0.00	10941 .73	9.70
Respiration rate at late pregnancy :	3	0.39	0.00	2860.92	0.00	3	5.18	9.44	17468.81	17.47	3	4.15	5.94	12379.35	13.12
Residual	30	3.97	94.79	8370.30	90.35	48	2.79	82.60	5702.44	64.06	20	3.22	82.69	5859.05	50.75

Respiration rate of doe:

A study of the effect of respiration rate of doe during pregnancy on litter size and litter weight at birth was carried out. Respiration rate of does was recorded at early and at late pregnancy, it was classified into < 120, $120 - < 140$, $140 - < 160$ and > 160 per minute within each stage of pregnancy. Results presented in Tables 19 and 20 show that there is a tendency of a relative decrease in litter size and litter weight at birth with increasing respiration rate during the first stage of pregnancy; though the differences in general were statistically non-significant. A reversed trend was, however, observed during the second stage of pregnancy. Litter size and litter weight were found to be relatively increased with increasing respiration rate, though the differences in general were also non-significant. Accordingly, effects of respiration rate of the doe during pregnancy did not exert any significant effect on both size and weight of the litters it kindled.

Coupling these findings with those of the effects of the doe's body temperature on the same traits, it could be stated that neither body temperature nor respiration rate of the doe during pregnancy showed significant influences on the size and weight of the litter it produced.

C. BODY WEIGHT

The overall means of body weight at different ages of Giza White, Bauscat and Grey Flander rabbits are presented in Table 21. Grey Flander rabbits were shown to be the lowest in weight at all ages compared with both Giza White and Bauscat which were nearly of the same body weight at most ages.

Body temperature:

The effect of body temperature on body weight at different ages within breed was studied by classifing the average of morning and afternoon body temperature into $\leq 39°C$, $> 39 - 39.5°C$ and $> 39.5°C$. It was found that variation in body weight due to differences in body temperature within each age and within each breed did not show any consistent trend and was statistically non-significant in most cases (Tables 21 and 22). Accordingly, body weight of rabbits of this study was not affected by body temperature.

Respiration rate:

The effect of respiration rate on body weight at different ages within breeds was studied by dividing the average of morning and afternoon respiration rate into classes of < 160, $160 - < 180$, $180 - < 200$ and ≥ 200 per minute. Resutls of the analysis in Tables

Table (21) : Least squares constants ± standard errors of body weight at different ages as affected by body temperature and respiration rate.

CLASSIFICATION	WEANING		6 WEEKS		8 WEEKS		10 WEEKS		12 WEEKS		14 WEEKS		16 WEEKS	
	N	Const.±S.E.	N	Const.± S.E.	N	Const. ±S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const. ± S.E.	N	Const.± S.E.
						GIZA WHITE								
General mean	121	387.9 ± 17.0	112	495.3 ± 29.5	103	629.3 ± 36.0	93	719.9 ± 19.5	84	776.2 ± 54.8	51	1034.0±80.5	40	1287.2 ± 116.4
Body temperature														
≤ 39 °C.	21	9.1 ± 22.3 a	18	-21.5 ± 36.3 a	13	-9.9 ± 41.0 a	24	-32.5 ± 19.4 a	8	-26.6 ± 64.7 a	4	171.3± 79.6a	1	-242.5 ± 172.7ab
39.1 - 39.5 °C.	94	12.1 ± 17.8 a	90	-16.9 ± 29.6 a	88	-34.5 ± 35.2 a	69	32.5 ± 19.4 a	74	109.3 ± 53.7 a	44	-65.5± 55.2b	37	-128.9 ± 100.6a
> 39 °C.	6	-21.2 ± 30.6 a	4	38.4 ± 52.1 a	2	44.4 ± 64.9 a			2	-82.7 ± 94.4 a	3	-105.8± 86.5ab	2	371.4 ± 144.1b
Respiration rate														
< 160 / minute	24	22.3 ± 18.6 a	39	25.7 ± 25.4 a	34	13.1 ± 22.7 a	29	40.8 ± 25.1 a	6	-15.3 ± 60.9 a	1	41.5±155.6 a	1	-58.3 ± 180.5ab
160-179/minute	32	-6.8 ± 16.5 a	16	-32.5 ± 32.2 a	13	13.0 ± 30.8 a	18	-30.2 ± 27.5 a	25	47.4 ± 37.3 a	13	99.3± 75.6 a	16	-158.6 ± 81.5a
180-199/minute	42	15.4 ± 15.2 a	49	32.5 ± 23.8 a	46	6.2 ± 21.3 a	46	-10.6 ± 22.4 a	34	11.5 ± 35.1 a	35	-34.8± 68.4a	18	35.2 ± 79.3 b
≥ 200 / minute	22	-30.9 ± 18.9 a	8	-26.6 ± 42.0 a	10	-32.3 ± 34.0 a			19	-43.6 ± 40.9 a	2	-106.0±119.0a	5	181.7 ±101.1 b
						BAUSCAT								
General mean	194	385.6 ± 11.8	186	482.5 ± 16.3	178	599.6 ± 15.2	157	734.2 ± 23.3	141	878.9 ± 20.6	87	1067.8± 37.7	78	1185.6 ± 53.3
Body temperature														
≤ 39 °C.	41	14.4 ± 16.8 a	44	-23.6 ± 19.3 a	34	21.5 ± 20.6 a	28	-13.7 ± 28.9 a	16	17.2 ± 34.1 a	12	-24.8± 48.7 a	13	-28.6 ± 63.6 a
39.1 - 39.5 °C.	142	-17.4 ± 12.7 a	137	-4.4 ± 16.8 a	135	-9.6 ± 16.3 a	124	2.4 ± 24.3 a	109	-9.3 ± 23.1 a	71	-56.5± 38.1 a	63	9.7 ± 53.2 a
> 39.5 °C.	11	3.0 ± 21.7 a	5	33.9 ± 30.9 a	9	-11.9 ± 28.5 a	5	11.3 ± 43.6 a	16	-7.9 ± 33.3 a	4	81.3± 64.3 a	2	18.9 ± 98.3 a
Respiration rate														
< 160 /minute	65	16.6 ± 13.4 a	69	31.3 ± 12.8 a	59	32.6 ± 14.6 a	43	58.1 ± 20.0 a	19	19.5 ± 33.2 ab	9	5.9± 49.9ab	4	79.6 ± 82.7 a
160 - 179/minute	47	18.0 ± 12.8 a	19	-9.7 ± 18.3 ab	29	-2.7 ± 18.4 a	36	-7.1 ± 20.2 b	36	5 .4 ± 25.1 ab	22	-23.2± 36.1ab	30	-70.6 ± 42.6 a
180 - 199/minute	49	1.8 ± 12.6 ab	65	-24.1 ± 12.3 cb	53	-15.3 ± 15.2 a	49	-42.5 ± 18.3 b	46	49.4 ± 23.1 a	43	-70.8± 30.6a	38	-62.9 ± 41.6 a
≥ 200 / minute	33	-36.4 ± 14.6 b	33	2.5 ± 15.1 ac	37	-14.6 ± 20.0 a	29	-8.5 ± 21.9ab	40	-74.3 ± 24.9 b	13	88.1± 43.7b	6	53.9 ± 69.4 a
						GREY FLANDER								
General mean	100	355.2 ± 8.1	91	431.4 ± 8.7	77	579.8 ± 10.8	67	703.7 ± 14.3	61	818.0 ± 22.0	38	913.8± 36.6	28	988.4 ± 43.5
Body temperature														
≤ 39 °C.	23	-7.2 ± 8.1 a	30	5.5 ± 8.5 a	29	-5.1 ± 11.1 a	22	2.5 ± 14.6 a	13	8.2 ± 20.3 a	9	-72.9± 30.9 a	4	-28.4 ± 42.1a
> 39 °C.	77	7.2 ± 8.1 a	61	-5.5 ± 8.5 a	48	5.1 ± 11.1 a	45	-2.5 ± 14.6 a	48	-8.2 ± 20.3 a	29	72.9± 30.9 b	24	28.4 ± 42.1a
Respiration rate														
< 160 /minute	30	-2.4 ± 10.1 a	29	-20.3 ± 11.6 a	22	-44.5 ± 15.7 a	22	-40.0 ± 20.0 a	11	-44.5 ± 30.3 a	4	-33.9± 57.3a	4	-28.8 ± 55.9ab
160 - 179/minute	23	4.4 ± 10.6 a	17	- 4.6 ± 13.5 ab	24	52.9 ± 15.0 b	10	32.8 ± 22.7 a	10	46.6 ± 30.4 a	7	63.2± 49.6a	11	-81.2 ± 43.1a
≥ 180 -/minute	47	-2.0 ± 9.1 a	45	24.6 ± 10.8 b	31	-8.4 ± 14.3 a	35	7.2 ± 17.9 a	40	- 2.1 ± 22.6 a	27	-29.3± 37.4a	13	110.0 ± 41.3b

Table (22) : Least squares analysis of variance of body weight at different ages as affected by body temperature and respiration rate.

Source of Variation	Weaning			6 Weeks			8 Weeks			10 Weeks			12 Weeks			14 Weeks			16 Weeks		
	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %	d.f	Mean square	Variance %
									GIZA WHITE												
Body temperature	2	3022.53	0.00	2	9587.13	0.000	2	8933.23	0.00	1	58349.51	5.21	2	93165.51	0.00	2	104165.80	19.34	2	255151.80 **	46.84
Respiration rate	3	14358.72	1.08	3	23336.45	0.26	3	5518.26	0.00	2	30417.70	1.13	3	30486.05	0,00	3	63260. 80	5.66	3	175293.10 **	11.52
Residual	115	10959.45	98.92	106	22012.23	99.74	97	17612.54	100.00	89	24375.73	93.66	78	36389.13	100.00	45	40276.98	75.00	34	55860.71	41.64
									BAUSCAT												
Body temperature	2	13646.57	1.11	2	12232.97 *	0.64	2	11901.18	0.00	2	2935.55 *	0.00	2	4216.88	0.00	2	38934.82	1.22	2	6840.58	0.00
Respiration rate	3	22779.22	2.97	3	30642.51 *	4.88	3	24898.82	2.59	3	71998.94 *	6.64	3	108539.70 **	8.44	3	88352.63	8.04	3	47402.84	1.69
Residual	188	9872.85	95.92	180	10015.12	94.48	172	13870.43	97.41	151	19733.83	93.36	135	27332 .39	91.56	81	33200.40	90.74	73	37618.45	98.31
									GREY FLANDER												
Body temperature	1	3504.20	0.00	1	2336.96	0.00	1	1776,62 **	0.00	1	286.20	0.00	1	2550.57	0.00	1	131661.80	27.32	1	10811.10	0.00
Respiration rate	2	384.71	0.00	2	18120.78 *	5.52	2	55972.98 **	18.89	2	19949.42	5.64	2	20374.92	2.02	2	22976.61	0 .00	2	113046.10	30.81
Residual	96	4469.67	100.00	87	5555.86	94.48	73	8312.11	81.11	63	9740.19	94.36	57	15554.53	97.98	34	23300. 24	72.68	24	23713 .34	69.19

21 and 22 show that body weight differed with changes in respiration rate with a tendency of a small decrease in body weight when respiration rate increased to 180 and more per minute. Differences in body weight due to respiration rate within age and within breed were statistically not-significant in most cases. These results may indicate that when respiration rate increased above the mean of all rabbits of the three breeds at different ages (175 per minute), body weight was decreased. This may be due to higher loss in energy through respiratory system and may be due to less feed intake resulted from the stress arised from the increase in respiration rate ; therefore, growth rate was slightly decreased.

D. GENETIC PARAMETERS

1- Heritability Estimates

If it is assumed that no gene-environment correlation or interaction is present; the phenotypic variance (σ^2_P) then, consists of the genetic portion (σ^2_G) and the environmental fraction (σ^2_E). The genetic variance, further, may be subdivided into an additive genetic part (σ^2_A) and a non-additive part containing the dominant variance (σ^2_D), the epistatic variance (σ^2_I) and different kinds of gene interactions. The environmental variance may, also, contains the maternal effects which are common to members of particular subgroups.

For, purposes of selection, the amount of additive genetic variance of a character is of particular significance rather than of the genetic variance. This is because the additive variance is basically the property of the allele, wheareas dominance and epistasis are properties of the genotype. Thus heritability is the proportion of the phenotypic variance that is attributable to the average effects of genes, and, therefore, determines the degree of resemblance between relatives. For this reason, heritability enters into almost every formula connected with breeding methods.

A single pair mating analysis was used to estimate heritability for body temperature and respiration rate at different ages in Giza White and Bauscat rabbits. This analysis was based on the single pair mating design described by Becker (1975) in which pairs of males and females were chosen at random from the flock and mated together. Each mating between each pair produced several offspring. Between mating component of variance in this analysis represents covariance of full sibs and includes one half of the additive variance, one-quarter of the dominance variance and various amounts of the epistatic variance in addition to maternal variance.

Some estimates of heritability for each trait obtained from this analysis were either negative or larger than one. This may be due to the small number of sires or non-randomness in the distribution of the small numbers of offspring within matings. Such estimates are considered to be unreliable and, therefore, they were excluded from the discussion.

Body temperature:

Heritability estimates of body temperature in the morning and in the afternoon at different ages for Giza White and Bauscat rabbits are presented in Table (23). In Giza White, the estimates of morning body temperature

Table(23) : Heritability estimates[1] ± standard errors of body temperature in rabbits at different ages.

Age	Giza White		Bauscat	
	Morning	Afternoon	Morning	Afternoon
Weaning	1.66 ± 0.24	0.28 ± 0.31	0.22 ± 0.27	0.02 ± 0.15
8 weeks	0.17 ± 0.27	0.07 ± 0.21	0.04 ± 0.17	0.15 ± 0.24
12 weeks	0.00 ± 0.00	0.41 ± 0.50	0.31 ± 0.40	0.49 ± 0.46
16 weeks	0.65 ± 0.56	0.53 ± 0.54	0.19 ± 0.34	0.17 ± 0.33

1 Negative estimates are considered to be Zero.

at different ages ranged between 0.17 and 0.65, while those of the afternoon ranged between 0.07 and 0.53. Relative lower estimates of heritability were, however, derived from Bauscat rabbits. It ranged between 0.04 and 0.31 in the morning and between 0.02 and 0.49 in the afternoon.

It is clear, then, that almost similar ranges of heritability for body temperature were obtained in the morning and in the afternoon within breed. These results agree with the fact that rabbits are homeothermic animals and, therefore, they try to maintain nearly constant body temperature in different environments. Thus, genetic variation within breed and even within time of measurements are expected to be low.

Respiration rate:

Heritability estimates of respiration rate in the morning and in the afternoon at different ages for Giza White and Bauscat rabbits are presented in Table 24 . The estimates of morning respiration rate in Giza White at different ages ranged between 0.11 and 0.49, while those in Bauscat rabbits ranged between 0.15 and 0.60. The values in the afternoon were almost negative in both breeds. This indicate that the genetic variation in the morning respiration rate between individuals were naticeably higher than those in the afternoon. It seems that the

Table (24): Heritability estimates[1] ± standard errors of respiration rate in rabbits at different ages.

Age	Giza White		Bauscat	
	Morning	Afternoon	Morning	Afternoon
Weaning	0.49 ± 0.40	0.11 ± 0.21	0.00 ± 0.00	0.00 ± 0.00
8 weeks	0.00 ± 0.00	0.00 ± 0.00	0.15 ± 0.24	0.00 ± 0.00
12 weeks	0.45 ± 0.51	0.41 ± 0.50	0.60 ± 0.48	0.00 ± 0.00
16 weeks	0.11 ± 0.42	0.00 ± 0.00	0.45 ± 0.44	0.00 ± 0.00

1 Negative estimates are considered to be zero.

environmental conditions during morning were suitable or even optimal ones for the genes to express themselves properly. Variation between individuals in that time, therefore, were mostly genetic. But in the afternoon the prevailing environmental circumstances were unsuitable, thus other physiological processes may have interfered with the action of genes. This explaination agree with the previous results which indicated that morning air temperature was greatly lower than that of the afternoon. Respiration rate of afternoon was higher by about 25 per minute than that of morning.

2. Genetic and Phenotypic Correlations

The estimates of genetic and phenotypic correlation coefficients between each of body weight, body temperature and respiration rate at different ages derived by using the analysis of single pair mating in Giza White and Bauscat rabbits are presented in Tables 25 and 26.

The phenotypic coefficients between morning and afternoon body temperatures were generally possitive and relatively higher than those between morning body temperatures and afternoon respiration rates at each age within breed. However, the genetic relationships among those traits were found to be unreliable estimates (larger than one). A tendency of possitive estimates of phenotypic and genetic associations were found between morning body temperature and morning respiration rate in both breeds. The phenotypic correlations ranged between 0.03 and 0.40 in Giza White rabbits and between 0.17 and 0.28 in Bauscat rabbits. The respective genetic estimates ranged between 0.35 to 0.79 and between 0.16 to 0.77. Similar trend of possitive phenotypic and genetic relationships was, also, found between afternoon body temperature and afternoon respiration rate within each age in both breeds. The phenotypic correlations ranged between 0;15 and 0.29 in Giza

Table (25): Genetic and phenotypic correlation coefficients ± standard errors between traits in Giza White rabbits at different ages.

Traits	Body weight	Morning body temperature	Afternoon body temperature	Morning respiration rate	Afternoon respiration rate
Body weight					
Weaning		0.14 ± 0.14	-0.36 ± 0.13	-0.13 ± 0.15	-0.76 ± 0.06
8 weeks		-0.08 ± 0.15	0.13 ± 0.15	0.60 ± 0.10	0.59 ± 0.10
12 weeks		0.03 ± 0.21	0.15 ± 0.12	0.19 ± 0.21	0.14 ± 0.21
16 weeks		0.13 ± 0.22	0.43 ± 0.18	-0.45 ± 0.18	-0.01 ± 0.22
Morning body temperature					
Weaning	0.59 ± -0.16		-0.30 ± 0.13	0.34 ± 0.14	-0.09 ± 0.15
8 weeks	-0.93 ± 0.17		0.28 ± 0.14	0.03 ± 0.15	0.07 ± 0.15
12 weeks	1.31 ± 0.79		0.37 ± 0.18	0.40 ± 0.18	0.25 ± 0.20
16 weeks	0.64 ± 0.43		0.39 ± 0.19	-0.11 ± 0.22	-0.03 ± 0.22
Afternoon body temperature					
Weaning	-0.55 ± -0.66	-0.80 ± 0.10		-0.08 ± 0.15	0.29 ± 0.29
8 weeks	0.06 ± 1.55	1.82 ± -3.57		0.14 ± 0.15	0.19 ± 0.15
12 weeks	0.21 ± 0.72	1.19 ± 1.00		0.43 ± 0.17	0.27 ± 0.20
16 weeks	0.45 ± 0.62	0.83 ± 0.21		-0.03 ± 0.22	0.15 ± 0.22
Morning respiration rate					
Weaning	0.87 ± 0.14	0.46 ± 0.19	-0.28 ± 0.62		0.57 + 0.10
8 weeks	-1.14 ± 0.06	0.35 ± -0.17	-0.02 ± -0.27		0.86 ± 0.04
12 weeks	0.77 ± 0.29	0.79 ± 0.47	1.30 ± -0.60		0.81 ± 0.07
16 weeks	-2.01 ± -4.65	-1.49 ± -1.56	-0.40 ± -1.39		0.24 ± 0.21
Afternoon respiration rate					
Weaning	1.55 ± 1.23	-0.63 ± 0.22	0.38 ± 1.28	0.85 ± 0.24	
8 weeks	-2.48 ± 5.44	0.89 ± -0.22	0.42 ± -1.18	-1.24 ± -0.10	
12 weeks	0.98 ± 0.03	0.70 ± -1.23	1.09 ± -0.16	0.89 ± 0.20	
16 weeks	-0.32 ± -0.65	0.84 ± -0.18	-1.18 ± -0.26	-0.44 ± -1.05	

Estimates above the diagonal are phenotypic correlation coefficients, while those below the diagonal are genetic correlation coefficients.

Table (26): Genetic and phenotypic correlation coefficients ± standard errors between traits in Bauscat rabbits at different ages.

Traits	Body weight	Morning body temperature	Afternoon body temperature	Morning respiration rate	Afternoon respiration rate
Body weight :					
Weaning		-0.25 ± 0.13	-0.64 ± 0.08	0.09 ± 0.14	-0.83 ± 0.04
8 weeks		0.01 ± 0.14	0.41 ± 0.12	0.25 ± 0.14	0.89 ± 0.03
12 weeks		0.21 ± 0.16	0.30 ± 0.17	0.28 ± 0.17	0.65 ± 0.11
16 weeks		-0.15 ± 0.19	-0.11 ± 0.18	-0.42 ± 0.15	-0.29 ± 0.17
Morning body temperature					
Weaning	0.31 ± 0.76		0.44 ± 0.11	0.18 ± 0.14	0.18 ± 0.14
8 weeks	0.94 ± 0.01		0.23 ± 0.14	0.17 ± 0.14	0.13 ± 0.14
12 weeks	-0.56 ± 0.64		0.41 ± 0.15	0.21 ± 0.18	0.20 ± 0.18
16 weeks	-1.79 ± 2.21		0.33 ± 0.16	0.28 ± 0.17	-0.19 ± 0.17
Afternoon body temperature					
Weaning	5.10 ± 52.36	2.78 ± 14.43		0.12 ± 0.14	0.59 ± 0.09
8 weeks	0.37 ± 0.73	1.31 ± 1.32		0.29 ± 0.13	0.41 ± 0.12
12 weeks	0.40 ± 0.66	1.04 ± 0.08		0.52 ± 0.14	0.43 ± 0.15
16 weeks	-1.24 ± 1.40	0.52 ± 0.96		0.13 ± 0.18	0.27 ± 0.17
Morning respiration rate					
Weaning	-0.18 ± 1.40	0.16 ± 0.48	5.53 ±109.69		-0.11 ± 0.14
8 weeks	0.10 ± 0.83	1.29 ± 1.22	0.73 ± 0.53		0.47 ± 0.11
12 weeks	-0.31 ± 0.66	0.77 ± 0.29	0.51 ± 0.45		0.49 ± 0.14
16 weeks	-1.99 ± 5.48	1.04 ± 0.08	-0.19 ± 0.94		0.09 ± 0.18
Afternoon respiration rate					
Weaning	1.44 ± 0.20	-0.27 ± 0.18	-2.75 ± 8.99	-0.33 ± 0.94	
8 weeks	-0.92 ± 0.17	1.80 ± 5.41	0.47 ± 1.16	0.49 ± 1.13	
12weeks	-1.13 ± 0.20	0.00 ± 0.39	-0.27 ± 0.31	0.09 ± 0.30	
16 weeks	0.66 ± 0.91	0.07 ± 0.82	0.19 ± 0.82	0.11 ± 0.60	

Estimates above the diagonal are phenotypic correlation coefficients, while those below the diagonal are genetic correlation coefficients

White and between 0.27 and 0.59 in Bauscat rabbits. While the respective genetic estimates ranged between 0.38 to 0.42 and between 0.19 to 0.47. In addition, the phenotypic and the genetic assosiations between morning and afternoon respiration rates at each corresponding age were comparably higher than those between morning respiration rate and afternoon body temperature in both breeds.

These relationships indicate that body temperature at a given time of measurement is possitively associated with respiration rate at that time. One may expect that those genes as well as those envirnmental circumstances which affect body temperature may also affect evenly respiration rate at any time of measurement.

The fundamental genetic component of this correlation may arise from the pleiotropic effect of the genes of general effects, or because of those linked polygenic blocks that are integrated under selection. The positive estimate of genetic correlation between any two traits leads to the fixation of these causes and consequently to fixed association between the two traits under selection.

Negative phenotypic relationships were found between body weight and each of body temperature and respiration rate at weaning and at sixteen weeks of age. However ,

possitive correlation coefficients were obtained among these traits at eight and twelve weeks of age in both breeds. The genetic correlations between those traits were, however, unreliable estimates. It seems that there is no constant trend of association between body weight and each of heat tolerance traits at all ages.

Hassanien (1980) reported non-significant negative phenotypic correlation coefficients between those traits in Giza White rabbits.