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THERMO-RESPIRATORY RESPONSES OF BALADI KIDS TO SUBTROPICAL CLIMATE

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SUMMARY

This study was carried out at Maryot Research station located in the north western coastal strip of Egypt. The experiment was aimed at studying the effect of ambient temperature (AT), sex and body weight of Baladi kids on their thermal responses (rectal temperature (RT), skin temperature (ST) and coat temperature (CT)) as well as their respiration rate (RR) and haemoglobin level (Hb) in blood during their first year of life. RT increased under low AT levels either throughout the day (morning and evening) and/ or throughout the year (winter) due to shivering of superficial tissue. CT and ST increased, in general, with increasing AT. The effect of AT on thermal responses was more pronounced on CT than on RT or ST. During winter, RR increased under low AT level, while the reverse was the case in summer. Hb level in blood of kids had a negative relationship with AT. Sex and body weight of kids exerted, in most cases, no significant effect on the thermo-respiratory responses.

Keywords: Baladi, goat, kids, thermo-respiratory responses, subtropical climate

INTRODUCTION

Productive and reproductive processes of farm animals are known to be affected by climatic environment (Hafez, 1968). Hahn (1985) reported that performance of farm animals in terms of growth, behaviour, feed intake, mortality and well-being is altered in hot environment. Meanwhile, Gall (1981) reported that goats may become unable to move and may die from cold.

Egypt as a subtropical zone is characterized by high summer ambient temperature, intense solar radiation and low relative humidity. On the contrary, it has spells of very low air temperature (may reach less than 3°C) and windy weather in winter, particularly in the northern strip.

It is important to understand how animals function in a particular environment. So, this work was to conducted to study the thermo-respiratory responses of Baladi goats' kids during their first year of life to the climatic conditions of the North Western Strip in Egypt.

MATERIALS AND METHODS

This study was carried out at Maryot Research Station, belonging to the Desert Research Institute, and located in the North Western Coastal Strip of Egypt. Forty Baladi kids were used in the study, half of them were born during January 1984. The other half were born in November, 1984. Experimental work started from the first day of kid's life through 12 months of age.

Management:

Newborn kids were housed with their dams in a closed pen till weaning (3 months) to protect them against cold. Thereafter, they were housed in a semi-opened pen. After weaning, kids were supplemented daily with 0.25 Kg of pelleted concentrate mixture per head besides Berseem (Trifolium alexandrinum) in winter and alfafalfa (Medicago sativa) or hay in summer. Fresh water was allowed twice a day.

Physiological measurements:

Rectal temperature (RT), skin temperature (ST), coat surface temperature (CT) and respiration rate of kids (RR) as well as ambient air temperature (AT) were recorded three times a day (at 8 a.m., 2 p.m. and 8 p.m.). The first recording was taken on day one of kid's life. Subsequent recordings were at biweekly intervals until weaning and at monthly intervals thereafter. Recordings were stopped at 12 months of age.

Body weight of kids and haemoglobin concentration (Hb) in blood were determined only in the morning of each recording day.

RT was measured using a clinical thermometer inserted into the rectum for a length of 8 cm and a period of two minutes. ST was measured at a shorn spot on the mid-side region just behind the last rib using a telethermometer. CT was measured at a site close to that of measuring ST by locating the previous telethermometer gently on the hair surface. RR was recorded by counting flank movements for one minute. The counting was carried out before measuring thermal responses to avoid disturbing animals during the assessment of RR. AT was recorded using a mercury thermometer.

Hb in blood of kids was assessed using a Sahle apparatus. Body weight of kids, to the nearest 0.1 Kg, was recorded before feeding them in the morning of each recording day using a caged balance.

Statistical analysis:

Least squares analysis of variance (Harvey, 1960) was used to study the effects of AT, sex and body weight of kids on their thermo-respiratory response at each age studied (16 ages). Thermo-respiratory responses at only six ages were discussed in the Results and Discussion. These six ages were selected to represent all the stages of kid's life during the first 12 months of its age.

Simple correlation coefficients (Snedecor and Cochran, 1980) among different thermo-respiratory traits, based on the whole data collected, were also calculated.

RESULTS AND DISCUSSION

Climatic thermal conditions:

Table 1 presents the means of ambient air temperature as recorded diurnally by age of the kids. Animals were exposed to the lowest temperatures, particularly in the morning, during their young ages (up to 4 months) as well as their oldest age studied (12 months). It is clear from the Table that the diurnal differences in ambient temperature were slight at mid ages (6-10 months). During this period air temperature was 23.5°C in the morning while ranged between 25.5 and 28°C in the afternoon and between 25 and 26.5°C in the evening.

Table 1. Overall means of ambient temperature (°C) recorded at different six ages

Age of kids	Morning 8 a.m.	Afternoon 2 p.m.	Evening 8 P.M.
1 day	16.25	21.50	18.00
2.5 months	13.50	18.50	17.00
4 months	13.50	20.50	18.00
6 months	23.50	25.50	26.50
10 months	23.50	28.00	25.00
12 months	13.50	20.50	15.00

N= 40.

1- Thermal responses of the kids:

In order to study the effect of AT on different thermal responses of kids, values of AT were classified into two levels (high and low) as occurred naturally at each age (Table 2).

Table 3 shows that during winter months (ages of one day, 2.5, 4 and 12 months), kids raised in the high AT level had lower morning RT than those under low levels, while in warm summer months (ages 6 to 10 months), morning RT increased with increasing AT. Perhaps, there are two thresholds (minimum and maximum) of AT to induce changes in RT. At the minimum threshold, the neonate has to increase its metabolic production, thus increasing his body temperature to oppose the reduction induced by faster heat loss. Young animals are known to be susceptible to faster loss due to their greater proportional surface area and less efficient thermal insulation of their less completed hair coat. On the contrary, animals may surrender to higher temperatures (over the maximum threshold) due to the drop in physical heat dissipation in order to control body temperature. The findings of the present study support that of Anderson et al. (1956). Those authors reported that Angora goats began to shiver after they had been exposed to cold treatment, leading to a marked rise in their body temperature. Under warmer climatic conditions, Latief et al. (1985) found that increasing AT from 25 to 35°C caused a significant rise of 0.9°C in RT of Shiba goats.

Table 2. Ambient temperature levels (°C) at succesive ages of kids

Age of Kids	Morning		Afternoon		Evening	
	L	H	L	H	L	L
1 day	10	22.5	18.5	24.5	12	24
2.5 months	12	15.0	15.0	22.0	14	20
4 months	12	15.0	17.0	23.0	16	20
6 months	22	25.0	22.0	28.0	25	28
10 months	20	27.0	25.0	31.0	21	29
12 months	9	18.0	16.0	25.0	12	18

L= Low level of AT H= High level of AT

Morning ST and CT increased, in most cases, with increasing AT (Table 3). Since coat surface is directly exposed to the ambient air, the changes in CT are closely related to the changes in the temperature of the surrounding air. Bianca (1968) reported that ST is influenced by heat transfer from both the core and coat surface, but it is influenced more by coat temperature than by body temperature. In this respect, CT (Khalil, 1980 and Shalaby, 1985) and ST (Nassar and Hamed, 1980 and Sidibe and Steinbach, 1982) were found to increase with increasing AT.

With regard to afternoon recordings, Table 3 shows that RT, ST and CT were higher at all ages for kids subjected to high AT than for those under low AT except in the case of RT at 12 months of age.

At evening recording, kids raised under low AT had, in general, higher RT than those under high AT (Table 3), but the differences in RT due to differences in AT were not significant except at 12 months of age (Table 4). ST and CT behaved differently to RT, being higher under high AT particularly during cold months. Table 4 indicates that the effect of AT on thermal responses at either recording times was more pronounced on CT than on ST or RT.

Table 3. Least squares means (±SE) of thermal responses of kids to different levels of ambient temperature at successive ages

Age	RT(°C)		ST(°C)		CT (°C)	
	L	H	L	H	L	H
			Morning			
1 day	39.4±0.11	39.2±0.08	35.7±0.28	38.2±0.19	34.9±0.33	37.2±0.22
2.5 months	39.3±0.08	38.9±0.08	37.1±0.11	36.2±0.11	35.0±0.15	34.2±0.15
4 months	39.9±0.14	39.6±0.12	37.7±0.16	37.8±0.15	33.9±0.19	35.3±0.17
6 months	39.5±0.12	39.9±0.12	38.7±0.14	39.0±0.13	37.0±0.08	38.0±0.07
10 months	39.2±0.09	39.7±0.09	38.0±0.12	38.8±0.12	36.2±0.13	37.3±0.13
12 months	39.3±0.06	38.8±0.06	36.4±0.13	37.4±0.13	32.3±0.15	35.9±0.16
			Afternoon			
1 day	39.5±0.10	39.5±0.11	37.7±0.16	38.7±0.18	37.3±0.19	37.7±0.21
2.5 months	39.4±0.06	39.7±0.06	37.8±0.10	38.0±0.10	36.0±0.04	37.0±0.04
4 months	39.9±0.10	40.1±0.10	38.7±0.10	38.9±0.10	37.0±0.10	37.7±0.11
6 months	39.9±0.12	40.2±0.11	39.1±0.12	39.2±0.11	38.0±0.08	38.0±0.07
10 months	39.4±0.07	39.8±0.07	38.3±0.12	38.8±0.12	37.0±0.10	37.7±.010
12 months	39.5±0.06	39.3±0.06	38.2±0.13	38.3±0.14	35.8±0.12	37.1±0.12
			Evening			
1 day	39.6±0.15	39.4±0.09	37.4±0.25	38.5±0.15	36.5±0.29	37.5±0.17
2.5 months	39.4±0.06	39.5±0.06	37.7±0.11	38.6±0.12	35.7±0.10	37.6±0.10
4 months	39.7±0.13	39.4±0.14	38.6±0.16	38.3±0.17	36.3±0.11	37.1±0.12
6 months	39.9±0.12	39.7±0.13	39.0±0.10	38.9±0.11	38.0±0.10	37.4±0.11
10 months	39.5±0.09	39.4±0.09	38.4±0.13	38.3±0.13	37.0±0.08	37.2±0.08
12 months	39.2±0.06	39.0±0.06	37.2±0.14	37.6±0.15	33.8±0.15	36.2±0.16

n= 40.

L= Low level of ambient temperature.

H= High level of ambient temperature.

The correlation coefficients, based on the whole data, between AT and each of RT, ST and CT were all significant. The correlation of AT with CT was the highest (0.679) and that with RT was the lowest (0.204) while that with ST was in between (0.527). These findings confirm the results of the analysis of variance (Table 4) which indicate that CT was influenced more than ST or RT by the changes in AT.

The Correlation coefficients among different thermal responses were also significant, being 0.602 and 0.386 between RT and each of ST and CT, respectively. Meanwhile, CT showed higher correlation coefficient with ST (0.735). Shalaby (1985) working on Ossimi and Rahmani sheep reported significant correlations among AT, RT, ST and CT.

Table 4. Effect of ambient temperature (AT), sex and body weight (BW) of kids on their thermo-respiratory responses at successive ages

Age	S.V.	d.f	M.S. RT	ST	CT	RR	Hb
					Morning		
1 day	Sex	1	0.115	0.223	0.538	4.12	12.63
	AT	1	0.045	8.967**	7.141**	468.05*	66.01
	BW	1	0.382*	0.557	0.529	0.06	3.62
	Res.	36	0.061	0.375	0.494	136.88	53.84
2.5	Sex	1	0.162	0.318	0.001	7.09	93.78
	AT	1	1.133**	6.086**	4.879**	79.16**	26.84
	BW	1	0.002	0.214	0.183	4.20	91.37
	Res.	36	0.106	0.204	0.387	9.01	56.08
4	Sex	1	0.188	0.497	0.258	35.11	92.94
	AT	1	0.298	0.044	8.674**	287.40*	55.79
	BW	1	0.001	0.020	0.003	45.63	46.52
	Res.	36	0.213	0.304	0.415	43.23	68.99
6	Sex	1	0.375	0.021	0.089	0.24	506.64**
	AT	1	0.703	0.455	4.603**	816.53**	31.88
	BW	1	0.077	0.024	0.128	65.42	311.49*
	Res.	36	0.194	0.235	0.072	31.78	44.14
10	Sex	1	0.038	0.001	0.004	22.92	173.38
	AT	1	1.163**	3.373**	7.770**	21.19	1363.22**
	BW	1	0.973	1.059	0.439	42.18	111.09
	Res.	36	0.113	0.193	0.243	116.87	58.05
12	Sex	1	0.016	0.010	0.047	69.59	114.68
	AT	1	1.215**	6.837**	81.150**	6.11	61.30
	BW	1	0.449*	1.520	0.612	15.09	1.11
	Res.	36	0.060	0.260	0.365	6.34	44.58
				Afternoon			
1 day	Sex	1	0.203	0.252	0.101	36.73	
	AT	1	0.169	1.704**	0.332	745.71**	
	BW	1	0.304	0.320	0.005	381.04	
	Res.	36	0.129	0.317	0.428	137.73	
2.5	Sex	1	0.026	0.541	0.052	34.20	
	AT	1	0.645**	0.299	6.862**	11.49	
	BW	1	0.012	0.023	0.074	19.19	
	Res.	36	0.064	0.155	0.024	11.31	
4	Sex	1	0.390	0.178	0.020	1.74	
	AT	1	0.295	0.159	2.652**	551.46**	
	BW	1	0.018	0.040	0.145	28.92	
	Res.	36	0.128	0.133	0.132	35.44	

Table 4. Cont.

Age	S.V.	d.f	M.S. RT	ST	CT	RR	Hb
6	Sex	1	0.065	0.200	0.080	91.12	
	AT	1	0.552	0.122	0.010	180.85*	
	BW	1	0.050	0.042	0.097	0.15	
	Res.	36	0.182	0.188	0.079	40.30	
10	Sex	1	0.301	0.012	0.039	50.20	
	AT	1	0.670**	1.461*	2.653**	297.15	
	BW	1	0.537*	0.629	0.511	56.58	
	Res.	36	0.066	0.210	0.153	226.89	
12	Sex	1	0.001	0.519	2.002**	0.36	
	AT	1	0.138	0.044	10.416**	46.13	
	BW	1	0.378*	0.519	0.370	6.19	
	Res.	36	0.058	0.274	0.222	14.43	
				Evening			
1 day	Sex	1	0.067	0.371	0.278	321.2	
	AT	1	0.086	1.697*	1.803*	2220.4**	
	BW	1	0.106	0.204	0.524	6.5	
	Res.	36	0.128	0.387	0.504	101.1	
2.5	Sex	1	0.039	0.794	2.333**	20.3	
	AT	1	0.069	5.220*	25.420**	89.8*	
	BW	1	0.011	0.063	0.008	7.8	
	Res.	36	0.056	0.218	0.153	6.2	
4	Sex	1	0.255	0.013	0.758	1.2	
	AT	1	0.411	0.664	3.012**	156.4	
	BW	1	0.034	0.043	0.161	239.7*	
	Res.	36	0.249	0.360	0.172	43.7	
6	Sex	1	0.156	0.048	0.139	3.0	
	AT	1	0.197	0.014	1.878**	364.6*	
	BW	1	0.005	0.279	0.001	105.9	
	Res.	36	0.200	0.144	0.144	57.3	
10	Sex	1	0.001	0.169	0.342	18.5	
	AT	1	0.200	0.114	0.327	225.1	
	BW	1	0.187	0.139	0.001	425.6	
	Res.	36	0.122	0.238	0.100	119.3	
12	Sex	1	0.077	1.105	1.017	22.1	
	AT	1	0.365*	1.563*	37.202**	53.7*	
	BW	1	0.560**	1.839*	0.623	1.2	
	Res.	36	0.061	0.313	0.357	11.6	

* Significant at P<0.05

** Significant at P<0.01

Table 5, shows that the temperature gradient from rectal to ambient air via skin and coat tended to be higher under low levels of AT, particularly during cold months, than under high AT levels during warmer months. The greater drop from RT to ST under low AT during young ages may be due to poor insulative properties of body coat. Therefore, skin of kids became more influenced by the surrounding cool air and markedly decreased leading to faster heat loss. This gradient decreased during hot summer because of the increased ST by surrounding hot air and/ or via vasodilation of superficial circulation which activates body heat dissipation. At 12 months of age (next winter season), the gradient from RT to ST increased again particularly under low level of AT, probably due to vasoconstriction of skin circulation which resulted in reduced ST. Furthermore, under such low AT, ST might be influenced more by heat transfer from the cool coat surface rather than by heat transfer from the body core. The other gradients (from ST to CT, from CT to AT and from RT to AT) behaved similarly to the gradient from RT to ST, being higher under low AT and vice versa.

Table 5. Temperature gradient ($^{\circ}$C) in kids at different successive ages

Age (month)	RT-St		ST-CT		CT-AT		RT-AT	
	L	H	L	H	L	H	L	H
1 day	3.71	0.77	0.80	1.0	24.9	13.2	29.4	15.0
2.5	2.18	1.72	2.10	1.0	23.0	15.0	27.3	17.7
4	2.18	1.23	3.80	1.2	21.9	14.7	27.9	17.1
6	0.81	1.02	1.70	1.2	15.0	10.0	17.5	12.2
10	1.21	0.97	1.80	1.1	16.2	6.7	19.2	8.8
12	2.86	1.02	4.10	1.2	23.3	12.1	30.3	14.3

n= 40. L= Low level of ambient temperature.

H= High level of ambient temperature.

Whith few exceptions, female kids showed slightly higher thermal responses, particularly in the morning, over those of males (Table 6). However, the effect of sex on these responses was, in most cases, insignificant (Table 4). Taneja and Bhatnagor (1958) and Bianca (1968) reported that sex did not seem to have clear cut effects on normal body temperature of adult calves.

Table 6. Least squares means (±SE) of thermal responses at successive ages as classified by sex of kids

Age (month)	RT (°C)		ST (°C)		CT (°C)	
	M	F	M	F	M	F
			Morning			
1 day	39.3±0.06	39.4±0.07	37.5±0.15	37.3±0.14	36.7±0.18	36.5±0.17
2.5 months	39.0±0.08	39.2±0.07	36.5±0.11	36.7±0.10	34.6±0.15	34.6±0.14
4 months	39.7±0.12	39.8±0.11	37.6±0.14	37.9±0.13	34.5±0.16	34.7±0.15
6 months	39.6±0.11	39.8±0.10	38.8±0.12	38.8±0.12	37.5±0.07	37.6±0.06
10 months	39.4±0.09	39.5±0.08	38.4±0.11	38.4±0.11	36.8±0.13	36.8±0.13
12 months	39.0±0.06	39.1±0.06	37.0±0.08	36.9±0.12	34.0±0.16	34.1±0.14
			Afternoon			
1 day	39.3±0.06	39.4±0.08	38.2±0.14	38.0±0.13	37.4±0.16	37.3±0.16
2.5 months	39.6±0.06	39.5±0.06	38.1±0.09	37.8±0.09	36.5±0.04	36.4±0.03
4 months	39.9±0.09	40.1±0.08	38.8±0.09	38.9±0.08	37.3±0.09	37.4±0.08
6 months	40.0±0.11	40.1±0.10	39.0±0.11	39.2±0.10	38.0±0.07	37.9±0.07
10 months	39.5±0.07	39.7±0.06	38.6±0.12	38.6±0.11	37.3±0.10	37.4±0.10
12 months	39.4±0.06	39.4±0.06	38.4±0.14	38.1±0.12	36.7±0.12	36.2±0.11
			Evening			
1 day	39.4±0.11	39.5±0.10	38.2±0.18	38.0±0.17	37.4±0.21	37.2±0.19
2.5 months	39.4±0.06	39.5±0.05	38.0±0.11	38.3±0.11	36.4±0.09	37.0±0.09
4 months	39.5±0.12	39.7±0.12	38.4±0.14	38.5±0.14	36.5±0.10	36.8±0.10
6 months	39.7±0.12	39.9±0.11	39.0±0.10	38.9±0.09	37.6±0.10	37.7±0.09
10 months	39.4±0.09	39.4±0.08	38.5±0.13	38.3±0.12	37.0±0.08	37.2±0.08
12 months	39.2±0.06	39.1±0.06	37.6±0.15	37.2±0.13	35.2±0.16	34.8±0.14

n= 40, M= Male kids, F= Female kids.

Table 7 shows that the relationship of body weight of kids with their thermal responses did not indicate a definite trend. It was negative and insignificant in most cases. However, Barghout (1981) reported a positive and significant influence of body weight on RT of growing Ossimi lambs.

Table 7. Regression coefficients (±SE) of thermo-respiratory responses of kids on their body weight

Age (month)	RT(°C)	ST (°C)	CT (°C)	RR	Hb gm/100 ml
			Morning		
1 day	0.22±0.09*	0.27±0.22	0.26±0.25	-0.09±4.21	0.68±2.64
2.5	0.01±0.03	-0.04±0.04	-0.04±0.05	-0.18±0.26	0.83±0.65
4	-0.01±0.03	0.01±0.04	0.01±0.05	-0.48±0.47	0.49±0.59
6	0.02±0.03	-0.01±0.03	0.02±0.02	-0.53±0.37	1.15±0.44*
10	-0.06±0.02	-0.06±0.02	0.04±0.03	-0.37±0.62	0.60±0.44
12	-0.03±0.01*	-0.06±0.02	-0.04±0.03	0.18±0.12	0.05±0.32
			Afternoon		
1 day	0.19±0.12	0.20±0.20	0.02±0.23	-6.80±4.09	
2.5	0.01±0.02	-0.01±0.03	-0.02±0.01	-0.38±0.29	
4	0.01±0.03	-0.01±0.03	-0.03±0.03	-0.39±0.43	
6	-0.01±0.03	-0.01±0.03	-0.02±0.02	0.02±0.40	
10	-0.04±0.02	-0.04±0.03	-0.04±0.02	-0.43±0.86	
12	-0.03±0.01*	-0.03±0.02	-0.03±0.02	-0.12±0.18	
			Evening		
1 day	0.12±0.13	0.17±0.23	-0.27±0.26	-0.95±3.74	
2.5	0.01±0.02	-0.02±0.04	-0.01±0.03	-0.24±0.22	
4	0.01±0.03	-0.01±0.04	-0.03±0.03	-1.50±0.45*	
6	0.01±0.03	-0.03±0.02	0.01±0.02	-0.64±0.48	
10	-0.02±0.02	-0.02±0.03	-0.01±0.02	-1.18±0.62	
12	-0.04±0.01**	-0.06±0.03*	-0.04±0.03	-0.05±0.16	

* Significant at $P<0.05$.

** Significant at $P<0.01$.

2- Respiratory response of kids

Table 8 shows that the highest RR at either recording times was for one-day old kids. These values were almost double those recorded for kids aged 2.5 and 4 months although they were also exposed to approximately similar low AT. Aliverdiyev *et al*. (1956) concluded that the higher RR in new born lamb's appears to represent an adaptation in accordance with the increase in their metabolism and heat production. The decrease in RR of kids after one day of age may be attributed to a corresponding decline in heat production per kilogram body weight which induces similar decrease in thyroid activity in spite of body weight (Kibler and Brody, 1951).

However, a marked increase in RR was observed during hot months. Vihan and Sahni (1981) found the RR of Jamunapari goats to be higher during hot humid conditions. Bianca (1968) and Hales and Brown (1974) reported that increased RR under high AT is a mean of increasing heat dissipation via the respiratory passage.

The effect of AT on RR of kids (Table 4) was significant in most cases. Furthermore, the correlation coefficient between RR and AT (0.239), although low, was also significant. Khalil (1980) and Shalaby (1985) reported similar findings with different breeds of sheep.

The correlation coefficients between RR and each of CT, ST and RT were 0.326, 0.095 and 0.117, respectively. Only the first correlation was significant. These findings are in agreement with the results of Symington (1960) who concluded that variations in RR occur in order to maintain the stability of rectal and skin temperature.

The effect of sex on RR of kids (Table 4) was mostly insignificant. Table 8 shows that female kids, with few exceptions, had a slight increase in their RR over those of males. Hassan *et al*. (1983) found no significant differences in RR of adult Barki goats due to their sex.

Table 8. Least squares means (±SE) of respiratory response (RR) and haemoglobin concentration (Hb) in blood (gm/100 ml) classified by ambient temperature level and sex of kids

Response	Classification		Mean ±SE	1 day	2.5	4	6	10	12
						Age (month)			
				Morning					
RR	AT		x	74.7	24.8	24.2	25.0	38.3	24.3
		L	SE	5.4	0.7	1.9	1.6	2.8	0.6
			x	56.9	21.4	32.2	37.8	40.3	23.3
		H	SE	3.7	0.7	1.8	1.5	2.9	0.7
	Sex		x	63.0	22.6	27.1	31.5	38.4	22.2
		M	SE	2.9	0.7	1.7	1.4	2.8	0.7
			x	63.7	23.5	29.3	31.3	40.2	25.4
		F	SE	2.8	0.7	1.5	1.3	2.6	0.6
Hb	AT		x	15.1	15.8	14.9	13.1	16.4	16.1
		L	SE	3.4	1.9	2.5	1.9	2.0	1.6
			x	16.1	15.4	14.3	12.6	13.7	15.5
		H	SE	2.3	1.8	2.2	1.8	2.0	1.8
	Sex		x	15.7	15.3	14.4	12.1	14.6	15.4
		M	SE	1.3	1.2	1.3	1.1	1.1	1.1
			x	15.9	15.9	14.8	13.6	15.5	16.2
		F	SE	1.8	1.8	2.1	1.7	2.0	1.8
				Afternoon					
RR	AT		x	74.4	26.4	25.2	35.3	46.8	32.5
		L	SE	3.4	0.8	1.7	1.8	3.9	0.9
			x	59.3	25.2	36.3	41.2	54.1	29.9
		H	SE	3.7	0.8	1.7	1.6	4.0	1.0
	Sex		x	67.7	24.8	30.9	36.4	49.0	31.3
		M	SE	2.9	0.8	1.5	1.6	3.9	1.0
			x	65.6	26.8	30.5	40.1	50.8	31.1
		F	SE	2.8	0.8	1.4	1.5	3.7	0.9
				Evening					
RR	AT		x	89.8	26.7	29.8	39.7	37.4	27.3
		L	SE	4.1	0.6	1.8	1.9	2.8	0.8
			x	56.4	23.1	35.3	31.4	43.8	24.4
		H	SE	2.5	0.6	1.8	2.1	2.9	0.9
	Sex		x	69.5	24.2	32.4	35.2	39.8	25.0
		M	SE	3.0	0.6	1.6	2.0	2.8	0.9
			x	63.3	25.7	22.7	35.9	41.4	26.7
		F	SE	2.7	0.6	1.6	1.8	2.7	0.8

n= 40.

L= Low level of ambient temperature. M = Male.

H= High level of ambient temperature. F= Female.

It is clear from Table 7 that the regression coefficients of RR on body weight of kids at different successive ages were mostly negative and insignificant. Barghout (1981) reported a positive and insignificant regression of RR on body weight of Ossimi lambs. The author attributed his result to the fact that air temperature was within the thermneutral zone (20°C).

3- Haemoglobin concentration in blood of kids:

Table 8 shows that Hb level in blood of kids after the first day of life decreased with increasing AT level, though the differences in blood Hb due to AT level were not significant except at 10 months of age (Table 4). It could also be observed from Table 8 that Hb level was the lowest during summer months particularly under the high level of AT. Furthermore, the correlation coefficient between blood Hb and AT was negative and significant, being 0.427. The tendency of blood Hb to decrease under high AT denotes an adaptation of lowering O_2 intake and metabolic heat production under high AT. Kawashti and Ghanem (1967) working on Merino x Barki sheep reported the same relationship. They concluded that water intake increases in hot climate leading to an increase in blood volume, thus, blood Hb tends to decrease.

The correlation coefficients of Hb in blood of kids with various thermo-respiratory responses were all negative. While the correlation of Hb with ST and CT were significant, being -0.211 and -0.235, respectively, they were insignificant (-0.074 and -0.035) with RT and RR, respectively.

Sex of kids had a non-significant influence on their blood Hb except at 6 months of age where it exerted a significant effect (Table 4). This result confirms that of Hassan et al. (1983) who reported insignificant influence on Hb in blood of Barki goats due to their sex. Table 8 shows that Hb in blood of female kids slightly exceeded that of males.

Body weight had less pronounced effect on blood Hb of baladi kids. Table 7 shows that the regression coefficients of Hb on body weight of kids were, in most cases, positive but insignificant.

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استجابة حرارة الجسم ومعدل التنفس فى الجداء البلدى للمناخ شبه الإستوائى

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أجريت هذه التجربة فى مزرعة ابحاث مريوط الواقعة فى الساحل الشمالى الغربى لمصر . وقد استهدفت التجربة دراسة تأثير حرارة الجو وجنس ووزن جسم الجداء البلدى على درجة حرارة كل من المستقيم و الجلد وسطح غطاء الجسم بالإضافة إلى معدل التنفس ومستوى الهيموجلوبين فى الدم خلال العام الأول من حياة الجداء .

وقد وجد أن انخفاض حرارة الجو أدى إلى زيادة حرارة المستقيم فى الجداء سواء خلال النهار (فى الصباح والمساء) أوخلال السنة (فى الشتاء) . وقد يكون ذلك راجعا لزيادة ارتعاش الأنسجة السطحية . ومن ناحية أخرى زادت درجة حرارة كل من الجلد وسطح غطاء الجسم بصفة عامة مع زيادة حرارة الجو . وكان تأثير حرارة الجو أكثر وضوحا على درجة حرارة سطح غطاء الجسم عنه على درجة حرارة كل من الجلد والمستقيم .

وقد ازداد معدل التنفس شتاء مع إنخفاض حرارة الجو، بينما كان العكس هو الصحيح فى الصيف . وقد وجدت علاقة عكسية بين حرارة الجو ومستوى الهيموجلوبين فى دم الجداء. وفى معظم الحالات لم يكن لجنس الجدى أو وزن جسمه تأثير معنوى على حرارة كل من المستقيم والجلد وسطح غطاء الجسم أو معدل التنفس للجداء.