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CROSSBREEDING OF ZARAIBI AND BARKI DOES, REPRODUCTIVE PERFORMANCE, GROWTH AND ADAPTABILITY OF F1 KIDS

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ABSTRACT

The present work was a part of a project entitled (Introducing the High Milk Yielding Zaraibi Goats into the Newly Reclaimed Areas). The objective was to improve goat milk production under the prevailing harsh conditions of the Egyptian deserts. Zaraibi goats is a breed recognized for hugh milk production and high reproductive performance. The plan of the project was designed to propagate the Zaraibi breed either as a pure breed or through crossbreeding with the Barki breed, the native breed of the Egyptian northwestern coastal desert. This work was carried out at Maryout Research Station, southwest of Alexandria, using 25 Barki does mated by Barki bucks for the production of Barki kids (BB) and 27 Barki does mated by Zaraibi bucks for the production of F1 kids (BZ). Another flock of pure Zaraibi does was also mated by the Zaraibi bucks for the propagation of pure Zaraibi (ZZ).

Barki does mated to Zaraibi bucks showed a high percentage of twin births (29.6%) compared to those mated to Barki bucks (12.0%). Average litter size was 1.38 for the BZ group while it was only 1.07 for BB. In addition, the BZ group gave higher body weight kids born/doe bred (1.63 kg) than that of BB (1.41 kg).

The results of the present study indicated that there was a clear advantage of ZZ kids body weight over that of BB and BZ kids, especially at the beginning of the 4th week after birth (4.33, 2.64 and 2.53 kg, respectively) and at 12 weeks of age (7.75, 5.70, and 4.64 kg, respectively).

The overall mean of the afternoon rectal temperature of BB kids was higher ($P<0.05$) compared to BZ kids (40.07 vs. 39.93 °C). The BZ kids had higher ($P<0.05$) overall morning coat temperature (33.47 vs. 33.11 °C) but a lower ($P<0.05$) temperature gradient from skin to the tip of the coat than those of BB kids (2.15 vs. 2.50 °C). These reflected a better insulation ability of the hair coat in BB kids. However, there were no differences in morning and afternoon skin temperatures and respiration rates. These results reflected the ability of BZ kids to control their body temperature under the harsh conditions of the northwestern coastal desert. The results of the present work demonstrated the capability of raising the Zaraibi breed in this area.

Keywords: Zaraibi and Barki goats, crossbreeding, reproductive performance, F1 kids, body weight, thermoregulation.

INTRODUCTION

At present, there is insufficient supply of milk although the per capita consumption of milk and its products is still low, 38.1 kg/yr. of milk plus 2 kg of butter and ghee (Soryal, 2000a). Relative commercial milk production in Egypt measured as milk yield / 1 kg BW of dairy animal / yr. was found in goats to be nearly twice that of buffaloes (4.01 vs. 1.91 kg milk/kg BW/yr.), which means that goats are more efficient in utilizing feeds to produce milk (Soryal, 2000 b). Although the goat' population in

Egypt is at 3.2 million heads (FAO, 1999), its production represents only 0.45% of Egypt total milk production. Therefore, it is important to improve goat milk yield to decrease the milk gap and to raise the living standards of inhabitants. Four goat breeds are raised in Egypt, mostly in the deserts, following an extensive production system. Three of these breeds, Seidi, Barki (in northwestern coastal desert) and Black Bedouins in Sinai, are surviving well with this system, but they are characterized by low productive performance especially in milk (52.92 kg according to Soryal and El-Sayed, 1994 and 60 kg milk according to Abdel Rahman *et al.*, 1998). Barki does attain 27 to 29 kg mature live body weight on average, while introduced to the buck for first time at the age of 20 to 22 months when their BW is about 20 kg (Soryal and El-Sayed, 1994). The fourth breed, Zaraibi or Egyptian Nubian is generally recognized for its distinguished milk production and prolificacy. However, it exists in rather small flock sizes and constitutes a very small segment of the goat population. Mature live body weight of Zaraibi does is 35 kg, and they are used for mating the first time at the age of 22 months with average live body weight of 25 to 27 kg (Abd El Reheem, 1998). In 1983, the Egyptian Ministry of Agriculture established a nucleus flock, which is now about 600 heads for improvement and propagation (Abd El Reheem, 1998). Since the Zaraibi breed is superior among goat breeds in Egypt, the present work deals with its propagation either as a pure breed or through crossing programs with Barki goats. As the Zaraibi breed was introduced into an area that is characterized by harsh climate, reproductive performance due to crossing in addition to the growth and adaptability of F1 kids had to be evaluated through studying the changes in their physiological responses in comparison to pure Barki kids.

MATERIALS AND METHODS

1. Establishment of Zaraibi flock:

All pure Zaraibi does and bucks were purchased from the nucleus flock located at El-Serw Station belonging to the Animal Production Research Institute (APRI), Ministry of Agriculture, Egypt. Four Zaraibi bucks (mother total milk yield averaged 211 kg / season of 150 days), in addition to three batches of 10 does each of the pure Zaraibi breed were purchased through November 1999 to September 2000. All purchased does had a pedigree certificate from APRI, including doe number, date of birth, identification of dam, sire and annual total milk yield for the mother during the last lactation season (150 days), which ranged from 300 to 360 kg. The new Zaraibi flock was housed at Maryout Research Station belonging to the Desert Research Center, 32 km south west of Alexandria. Before joining the flock at the station, the Zaraibi does and bucks were quarantined for 30 days. Also, the animals were tested three times for Brucella melitensis using the Rose Bingal test to ensure negative reactions and were also given several dosages of ivomec super (provided by MSD AGVET, Merck & Co., Inc., Whitehouse Station, N.J., U.S.A.) for the treatment and control of internal and external parasites.

2. Mating season:

Twenty-five Barki does (2 to 5 yr. old with an average BW of 26.57 $\pm$ 0.38 kg) were mated to three Barki bucks for the production of Barki (BB) kids. Other 27 Barki does (2-5 yr. old with average BW of 27.06 $\pm$ 0.37 kg)

were mated to the four purchased Zaraibi bucks for the production of F1 Zaraibi x Barki (ZB) kids. Bucks were rotated every day to avoid sire effect. The mating season started in October 1999 for two oestrous cycle length of 40 days. Kidding occurred during March and April 2000. Mating season was similarly carried out for the first purchased 10 pure Zaraibi does (average 3 yr old and 31.68 ± 1.79 kg BW) during February 2000 using pure Zaraibi bucks for the production of pure Zaraibi kids (ZZ). Kidding occurred during July 2000.

3. Feeding and housing:

The three groups of goats were housed separately in three shaded pens (5 x 8 m). Indoor group feeding was practiced, offering berseem (*Trifolium alexandrinum*) hay *ad. lib.* plus a concentrate feeding mixture (CFM) at the rate of 0.5 kg/head/day, which increased to 0.75 kg during late pregnancy and 1 kg during the lactation period. The CFM consisted of yellow corn 50%, undecortecated cotton seed cake 9%, wheat bran 10%, linseed meal 22%, molasses 5%,limestone 3% and common salt 1%. Fresh water was available twice a day. Chemical composition of feed stuffs is shown in Table 1.

Table (1): Chemical composition (%) of feed stuffs (as fed)

Ingredient	DM	OM	CP	EE	CF	NFE	Ash	TDN
Berseem hay	85.1	75.7	11.1	1.0	23.6	40.0	9.4	65.85
CFM	89.10	92.75	14.05	3.31	7.11	68.28	7.25	67.15

DM: dry matter; OM: organic matter; CP: crude protein; EE: ether extract; NFE: nitrogen free extract; TDN: total digestible nutrients

4. Measurements:

4.1. Individual reproductive data were recorded including mating and birth dates to determine birth, weaning weights, and litter size. Reproductive performance traits in terms of conception and kidding rates were calculated as percentages of does bred. Also, percentages of born and weaned kids were calculated. Each abortion or stillbirth was recorded as well as type of birth.

4.2. Body weight of BB and BZ kids were recorded weekly from birth to the 12^{th} week of age, then biweekly until the 24^{th} week of age. The differences were statistically examined using the t-test (Snedecor and Cochran, 1970). Body weights of Zaraibi females and their ZZ kids were recorded weekly during the suckling period (12 weeks) i.e. until weaning of kids.

4.3. Physiological responses were measured for BB and BZ kids weekly from 8 to 12 weeks of age, thereafter biweekly till 24 weeks of age. Rectal temperature was measured using a clinical thermometer, while skin and hair coat temperatures were recorded with a telethermometer (YSI, USA). Respiration rate was counted by observing flank movements through one minute. Measurements were recorded at 8 a.m. in the morning and 2 p.m. in the afternoon. Data obtained were statistically analyzed using a split plot design for repeated measurements with SAS software (SAS, 1998).

RESULTS AND DISCUSSIONS

1. Reproductive performance due to crossing:

The data of productive and reproductive performance of Barki does mated to either Barki or Zaraibi bucks are summarized in Table 2. Barki does were mated to Zaraibi buck showed slightly higher conception rate than Barki does mated to the same breed buck (81.1% vs. 80.0%). These conception rates were lower than those reported by Soryal (1999) in Syrian Gabaly goats in Egypt (83.8%) and by Badawy (1998) in Barki does that were mated to Barki bucks at the same area (86.7%). Results in the present study were higher than the value of 66.1% reported by Soryal and El-Sayed (1994) in Barki does mated to the same breed buck in the same area.

Barki does mated to Zaraibi bucks showed higher (14.8%) abortion rate, compared to Barki does (12.0%) mated to the same breed buck. This may be attributed to the higher live BW of the Zaraibi breed compared to Barki. Considering both conception and abortion rates, Barki does mated either with a Barki or Zaraibi buck had similar percentages of does with viable kids, which were 60.0 and 59.2%, respectively.

Table 2: Reproductive performance of Barki goats mated to either Barki or Zaraibi Bucks

Item	Barki x Barki (BB)		Zaraibi x Barki (ZB)	
	No.	%	No.	%
No. of does bred	25	100.0	27	100.0
No. of does conceived	20	80.0	22	81.5
No. of barren does	5	20.0	5	18.5
No. of does aborted	3	12.0	4	14.8
No. of does kidded	17	68.0	18	67.0
Kidding rate (does kidded/does bred)	0.68	68.0	0.67	66.7
No. of stillbirths	2	8.0	2	7.4
No. of does kidded viable kids	15	60.0	16	59.2
No. of viable kids born	16	64.0	22	81.5
No. of twin births	3	12.0[1]	8	29.6[1]
Average litter size	1.07 ± 0.101		1.38 ± 0.105	
No. of weaned kids	13	52.0	15	55.6
Birth weight (kg)	2.2 ± 0.137		2.0 ± 0.168	
kg kids born / doe bred	1.41± 0.095		1.63 ± 0.112	
Weaning weight Kg (12 weeks old)	5.70 + 0.19		4.64 + 0.17	
kg kids weaned / doe bred	2.96 ± 0.197		2.58 ± 0.209	

1, percent relative to does bred

Barki does mated to Zaraibi bucks showed a higher percentage (29.6%) of twin births relative to does bred compared to those mated to Barki bucks (12.0%). This advantage of twin birth for Zaraibi x Barki crossbred is also distinct from the average litter size (1.38) compared to those mated to Barki bucks (1.07). These results showed an advantage for crossing with the Zaraibi breed, which is evident also from the greater kilogram weight of BZ kids born/doe bred (1.63 kg) compared to that of BB (1.41 kg). These results are in agreement with Abd El Reheem (1998) in his 10 years study of the Zaraibi nucleus flock, which reported 1.9 litter size at birth and higher

heritability and repeatability for this trait. Soryal (1999) in a study with Syrian Gabaly goats in Egypt recorded a lower percent of twin births, 8.1%, while Soryal and El-Sayed (1994) recorded 16.1% twin birth in Barki does, being higher than 12% in the present study. At the same time, Badawy (1998) recorded litter size of 1.61 in Barki does under the same conditions.

2. Body weight changes in Barki (BB) and Barki X Zaraibi (BZ) kids:

Table 3 shows the changes in live BW and daily gain (DG) from birth to weaning and from weaning until the 24th week of age for BB and BZ kids. Average birth weight of BB kids was slightly higher than that of BZ kids (2.2 vs. 2.0 kg). Both were higher than the 1.71 kg in Egyptian Baladi kids obtained by Ashmawi (1982). However, these results were lower compared to 2.4 kg for Syrian Gabaly kids in their first lactation in Egypt (Soryal, 1998) and in their second lactation season of 2.75 kg (Soryal, 1999). Also, Soryal and El-Sayed (1994) reported higher values of 2.36 kg in Barki kids in the same area. Epstein and Herz (1964) reported much higher averages, compared to the present results, in Damascus male and female kids (3.60 and 3.2 kg, respectively).

Table 3: Changes in BW (kg) and daily gain (DG) from birth to weaning and from weaning to 24 weeks of age of Barki (BB) and F1 (BZ) kids

Age of kids (weeks)	BW kg		DG g/h/d	
	BB	BZ	BB	BZ
At birth	2.20 ± 0.11	2.00 ± 0.09		
2	3.28 ± 0.24	2.90 ± 0.17	36.0 ± 1.2	42.4 ± 1.5
4	2.64 ± 0.11	2.53 ± 0.21	47.0 ± 1.2	36.9 ± 0.9
6	4.05 ± 0.43	3.89 ± 0.21	39.3 ± 1.3	41.7 ± 1.0
8	4.34 ± 0.19	3.44 ± 0.16	44.6 ± 1.2	34.5 ± 1.2
10	4.58 ± 0.19	3.92 ± 0.17	49.4 ± 1.3	53.6 ± 1.4
12 (At weaning)	5.70 ± 0.19	4.64 ± 0.17	41.1 ± 1.3	39.9 ± 1.1
Overall DG from birth to weaning			42.9 ± 0.9	41.5 ± 0.8
14	6.39 ± 0.19	5.47 ± 0.18	46.2 ± 12.35	56.4 ± 11.90
16	6.61 ± 0.20	5.66 ± 0.19	9.2 ± 12.98	10.1 ± 12.38
18	7.37 ± 0.20	6.40 ± 0.20	26.3 ± 12.98	21.5 ± 14.50
20	7.05 ± 0.22	6.45 ± 0.23	-32.0 ± 14.49	-3.8 ± 14.97
22	8.29 ± 0.27	7.23 ± 0.24	26.3 ± 19.77	28.1 ± 15.89
24	8.82 ± 0.27	7.69 ± 0.24	27.51 ± 19.77	30.4 ± 15.89
Overall	5.05 ± 3.46 a	4.42 ± 4.12 b	30.28 ± 15.38 a	31.98 ±14.26 a

a, b: Overall means with the same letter are not different (P<0.05).

The weight of BB and BZ kids increased progressively with advancing age but at higher rates for BB kids until the weaning age at the 12th week (5.7 kg vs. 4.64 kg) (Table 3). The average weaning weight of BB kids was 22.8% above that of BZ kids. These results were lower than those reported by Ashmawi (1982) (6.14 kg) in Baladi kids; Soryal and El-Sayed (1994) (8.57 kg) in Barki kids; and Soryal (1998, 1999) in Syrian Gabaly kids (8.64 kg) in their first parity and 8.49 kg in their second parity in Egypt. The higher body weights of BB over BZ kids until weaning age may be attributed to their

efficiency in suckling their mothers compared to the new genotype BZ kids. After weaning, both kids were maintained on traditional feeds of hay and concentrate mixture, which resulted in improving body weights of BZ kids, even though they were still 12.8% lower than BB kids at the 24th week of age (8.82 vs. 7.69 kg). At this age, Soryal (1998, 1999) reported 12.20 kg for Syrian Gabaly kids in the first parity and 12.17 kg in the second parity. On average, breed differences were significant ($P<0.05$). Average daily gain of BZ kids from birth to weaning age was lower than that of BB kids (42.9 vs.41.5 g/day), which reflected the effect of suckling period. Being adapted to this area, BB kids seemed to be more efficient in suckling their mothers than the BZ kids. Later, growth in BZ kids improved during the periods from 12 to 24 weeks of age, which resulted in higher, but insignificant, overall average DG in BZ kids than that of BB kids (31.98 vs. 30.28 g/h/d) (Table 3). Soryal and El-Sayed (1994) reported 76.69 and 36.24 g/day for the same two periods in Barki kids while Soryal (1998, 1999) reported in Syrian Gabaly goats 31.67 and 80.29 g/day during the first parity and 43.41 and 29.40 g/day during the second parity.

3. Body weight changes in Zaraibi does and their kids during the suckling period:

Table 4 shows the changes in body weight of Zaraibi kids (ZZ) from birth until the 12th week of age (weaning age). The advantage in BW of ZZ kids was clear especially at the beginning of the 4th week after birth (4.33 kg) over that of BB and BZ kids in the present study (2.64 and 2.53 kg, respectively, Table 3). At weaning age, BW of ZZ kids was 7.75 kg which was higher than that of BB and BZ kids (5.7 and 4.64 kg, respectively). Soryal (1998, 1999) reported a weaning weight of 8.6 kg in Syrian Gabaly goats in the first parity and 8.5 kg in the second one. Also, Soryal and El-Sayed (1994) recorded 8.57 kg in Barki kids in the same area. These findings support the raising of Zaraibi goats at the new area of northwestern coastal desert of Egypt, since the ZZ kids in this study had higher BW in their first parity compared to BB and BZ kids. The conclusion is further supported by the fact that Zaraibi does maintained their BW with a minimum loss (0.89 kg on average) during the suckling period (Table 4), which might indicate their ability to utilize feeds for compensating nutrient loss in the milk. El-Sherif and Assad (2001) found in Barki ewes a significant decline due to lactation in blood hemoglobin (83.0 to 68.4 g/l), packed cell volume (28 to 22%), blood glucose (71.3 to 56.8 mg/dl) and plasma proteins (11.8 to 8.37 g/l), in addition to significant increase in aspartate amino transferase enzyme. These results demonstrated high metabolic stress during suckling period that induced impact on ewes' body weight. Keeping body weight in spite of the high milk yield suggested the advantage of raising Zaraibi goats in the new region. In addition, average BW of Zaraibi does under the new environment was still higher than those of other Egyptian breeds. However, a noticeable decrease in body weight was observed during the 9th week after kidding, 28.75 kg, which might be attributed to the stress of higher milk yield during this period. The same was found by Soryal (1998) who recorded 23.73, 22.13 and 23.9 kg BW of Syrian Gabaly goats at the 4th, 8th and 12th weeks of the first lactation, respectively.

During the second lactation season, the corresponding values were 26.94, 25.15 and 26.23 kg, respectively.

Table 4: Average live BW (kg) of Zaraibi does and their kids (ZZ) during the suckling period

Lactation week	Live BW	
	Kids (ZZ)	Does
At birth	2.25 + 0.10	
2	2.46 + 0.12	30.67 + 1.48
3	3.70 + 0.19	29.67 + 1.31
4	4.33 + 0.20	30.67 + 1.56
5	5.03 + 0.18	30.33 + 1.05
6	5.38 + 0.24	29.33 + 0.96
9	6.25 + 0.25	28.75 + 1.70
11	6.25 + 0.25	29.75 + 2.69
12	7.75 + 0.24	29.78 + 1.77
Average daily gain in kids (g/day)	63.46 + 3.82	

4. Physiological responses of Barki (BB) and Barki X Zaraibi (BZ) kids:

Diurnal changes in the meteorological data in terms of ambient temperature (AT) and prevailing relative humidity (RH) are illustrated graphically in Figure 1. Ambient temperature (AT) tended to be high at mid-day (14.00 h) and low at morning (08.00 h) during the experimental period. Diurnal changes in AT during different seasons were reported to affect various physiological parameters of Baladi goats in spite of their thermostability (Badawy *et al.*, 1999 and Khalifa *et. al.*, 2000). Relative humidity (RH%) showed an inverse trend to that of AT reducing the effect of high ambient temperature on animals as reported by Mokhtar *et. al.* (1986). It should be indicated that values of AT in early morning (20 °C) and afternoon (25 °C) were more close to the goat neutral zone reported by El-Sherbiny *et. al.* (1983) (20 -30°C) or by Lu (1989) (28°C). Mean values of rectal, skin, and hair coat temperatures (RT, ST and CT) in addition to respiration rate (RR) at both 08.00 h and 14.00 h, with its diurnal magnitude are presented in Table 5. Statistical analysis demonstrated that breed differences in all responses were not significant.

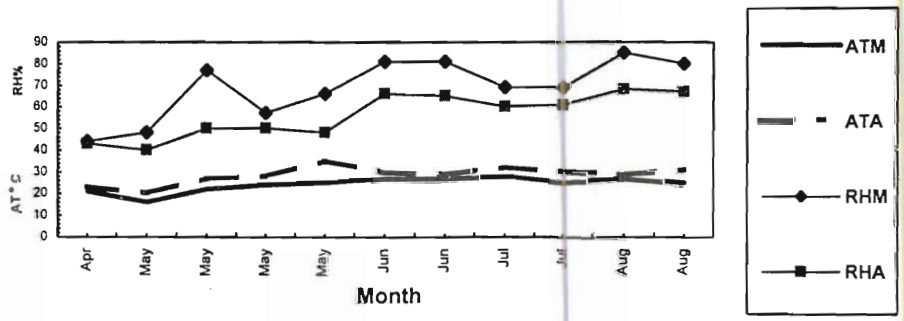

Figure 1: Air temperature (AT) centigrade and relative humidity (RH) percent in morning (M) and afternoon (A) during the experimental period

Table 5: Changes in physiological responses of Barki (BB) and Barki X Zaraibi (BZ) growing kids

	Age (wk.)	Breed	RT °C		ST °C		CT °C		RR/min		RTD	STD	CTD	RRD
			M	A	M	A	M	A	M	A				
27 April	8	BB	39.41	39.74	38.83	40.08	35.58	38.00	25.67	24.50	0.333	1.250	2.417	-1.167
		BZ	39.24	39.56	40.06	39.65	37.29	36.53	26.00	27.29	0.324	-0.412	-0.765	1.294
4 May	9	BB	38.48	39.90	38.25	41.33	34.92	36.08	23.00	28.50	1.425	3.083	1.167	5.500
		BZ	38.42	39.60	38.50	40.58	35.73	36.03	27.13	26.04	1.180	2.088	0.298	-1.081
11 May	10	BB	39.14	39.92	37.29	38.63	37.21	37.92	28.00	31.50	0.775	1.333	0.708	3.500
		BZ	38.92	39.59	36.78	38.37	36.89	37.69	27.38	27.92	0.667	1.588	0.798	0.544
18 May	11	BB	39.64	40.29	35.67	37.00	31.75	34.83	20.33	28.83	0.650	1.333	3.083	8.500
		BZ	39.47	39.96	35.72	36.99	32.47	35.47	22.61	22.24	0.490	1.266	2.999	-0.370
25 May	12	BB	39.47	40.45	33.42	38.42	30.67	36.67	24.83	55.50	0.983	5.000	6.000	30.667
		BZ	39.27	40.34	33.66	38.32	30.54	36.47	22.74	36.11	1.077	4.666	5.933	13.363
9 June	14	BB	39.62	39.99	34.33	34.25	31.50	31.33	16.50	26.67	1.375	-0.083	-0.167	10.167
		BZ	39.16	40.03	34.19	34.17	32.13	31.49	19.69	23.78	0.866	-0.025	-0.647	4.093
25 June	16	BB	39.31	40.21	37.37	31.56	30.69	33.81	18.72	34.25	0.899	-2.809	3.126	15.528
		BZ	39.26	40.05	34.21	32.18	31.07	33.91	19.44	38.87	0.792	-2.029	2.846	19.436
10 July	18	BB	39.83	40.23	35.46	35.56	34.51	34.09	25.99	39.52	0.408	0.100	-0.420	13.528
		BZ	39.91	40.24	35.41	34.85	34.83	33.77	28.24	43.85	0.343	-0.551	-1.064	15.611
25 July	20	BB	39.47	39.81	34.00	33.38	32.14	31.72	29.74	29.21	0.333	-0.620	-0.414	-0.528
		BZ	38.86	39.97	33.65	33.65	31.88	32.17	31.04	32.85	1.115	0.005	0.286	1.806
10 August	22	BB	40.21	40.09	34.76	36.00	33.37	35.08	26.61	33.02	-0.126	1.241	1.713	6.410
		BZ	40.02	39.80	33.94	35.46	32.93	35.14	28.47	30.13	-0.215	1.525	2.208	1.661
25 August	24	BB	38.95	40.00	32.76	35.17	30.20	33.25	29.94	40.35	1.057	2.408	3.046	10.410
		BZ	38.88	39.99	32.18	34.83	29.93	33.64	25.47	44.13	1.110	2.650	3.708	18.661
Overall		**BB**	**39.28**	**40.07**	**35.62**	**36.73**	**33.11**	**34.97**	**24.10**	**33.72**	**0.78**	**1.10**	**1.87**	**9.62**
		BZ	**39.19**	**39.93**	**35.63**	**36.70**	**33.46**	**34.86**	**24.04**	**31.49**	**0.74**	**1.07**	**1.39**	**7.45**
SE		**Breed**	**0.040**	**0.033**	**0.095**	**0.069**	**0.117**	**0.084**	**0.512**	**0.970**	**0.051**	**0.113**	**0.154**	**1.072**
		Age	**0.096****	**0.079****	**0.228****	**0.166****	**0.283****	**0.202****	**1.236****	**2.341****	**0.123****	**0.273****	**0.371****	**2.586****
		BxA	**0.135***	**0.112**	**0.323**	**0.235**	**0.400**	**0.286***	**1.749**	**3.310****	**0.174**	**0.386***	**0.525****	**3.657**

M = morning (8 a.m.), A = afternoon (2 p.m.), BW = live body weight, RT = rectal temperature, ST = skin temperature, CT = coat temperature, RR = respiration rate, D= diurnal variation, SE= standard error, BxA = interaction between breed and age, * = p< 0.05, ** = p< 0.01

4.1. Rectal temperature (RT °C):

Overall mean values of RT during the experimental period were found to be 39.28 and 39.19 °C at morning, while they were 40.07 and 39.93 °C at afternoon for BB and BZ kids, respectively (Table 5). The normal RT reported for goats ranged from 37.5 to 39.9 °C (Yousef, 1985, Abdel-Khalik, 1997 and Badawy *et al.*, 1999). This result indicated that BB and BZ kids were able to sustain homoeothermy regardless of differences in AT. In response to the high noon AT, goats showed high values of afternoon RT along the experimental period (39.74 to 40.45 °C for BB and 39.56 to 40.34 °C for BZ kids). Brody (1945) stated that the metabolism of small animals is higher per unit weight than is that of large ones. Blaxter (1977) and El-Sherif (1991) found that younger lambs had higher RT due to faster production of metabolic heat in counteraction to faster heat loss due to greater proportion of surface area. Despite of that, the ranges and maximums of RT in the present study indicated the ability of BZ (F1) to control their body temperature against high ambient temperatures. Diurnal changes in RT were found to follow the diurnal changes in AT.

Diurnal variation in RT did not differ significantly between both kid breeds. However, BB kids showed higher overall differences (0.78 vs. 0.74 °C) and the highest one (1.425 °C, at the 9th week of age) throughout the experimental period. These estimates of diurnal variations in RT were similar to those reported in Baladi goats (0.8 °C) by Badawy (1998). Age had effect ($P<0.01$) on variations of morning and afternoon RT (Table 5), mainly through seasonal changes (spring to summer) in AT.

4.2. Skin (ST °C) and coat temperature (CT °C):

Breed differences for skin and coat temperatures were insignificant. Overall means of ST were 35.62 and 35.63 °C in the morning and 36.73 and 36.70 °C in afternoon in BB and BZ kids, respectively (Table 5). The overall magnitudes of diurnal change were 1.10 and 1.07 °C for BB and BZ kids, respectively. Overall means in the morning CT were 33.11 and 33.46 °C for BB and BZ kids, respectively. The corresponding values in the afternoon were 34.97 and 34.86 °C, respectively. Diurnal magnitude was higher (1.87 °C) in BB kids than that in BZ kids (1.39 °C). The BZ kids could keep lower values of afternoon ST and CT and narrower diurnal variation. This might indicate better evaporative cooling through perspiration in BZ kids than BB kids in spit of insignificant.

4.3. Temperature gradients:

Figure 2 illustrates the trend of temperature gradient from core to skin (inner: IG), from skin to coat (middle: MG) and from coat to ambient temperature (outer: OG), either at morning or at afternoon. These gradients could give indication for the insulation ability of either the superficial tissues or the hair coat in addition to the efficiency of perspiration cooling. Table 6 shows the results of statistical analysis for these parameters. Breed differences were significant ($P<0.05$) for middle gradient at morning (MG), where it was higher in BB kids (2.504 °C) than in BZ kids (2.155 °C). However, OG in the morning was higher ($P<0.05$) in BZ kids (9.680 °C) than

in BB kids (9.091 °C). Bianca (1968) and El-Sherif (1991) stated that increased OG in newly born animals under cold weather indicated great heat flow to the environment due to decreased tissue and coat insulation, resulting in increasing metabolic rate testified by high RT under these conditions. The present results implied better insulation characteristics of superficial tissues of BB kids, the prevailing breed in northwestern coastal desert of Egypt, while hair coat insulation was better in BZ kids. During the heat of the day (afternoon), BB kids attained higher ST to reduce the temperature gradient between body surface and the environment. The overall mean of afternoon OG was 6.000 °C in BB kids, while was 6.736 °C in BZ kids.

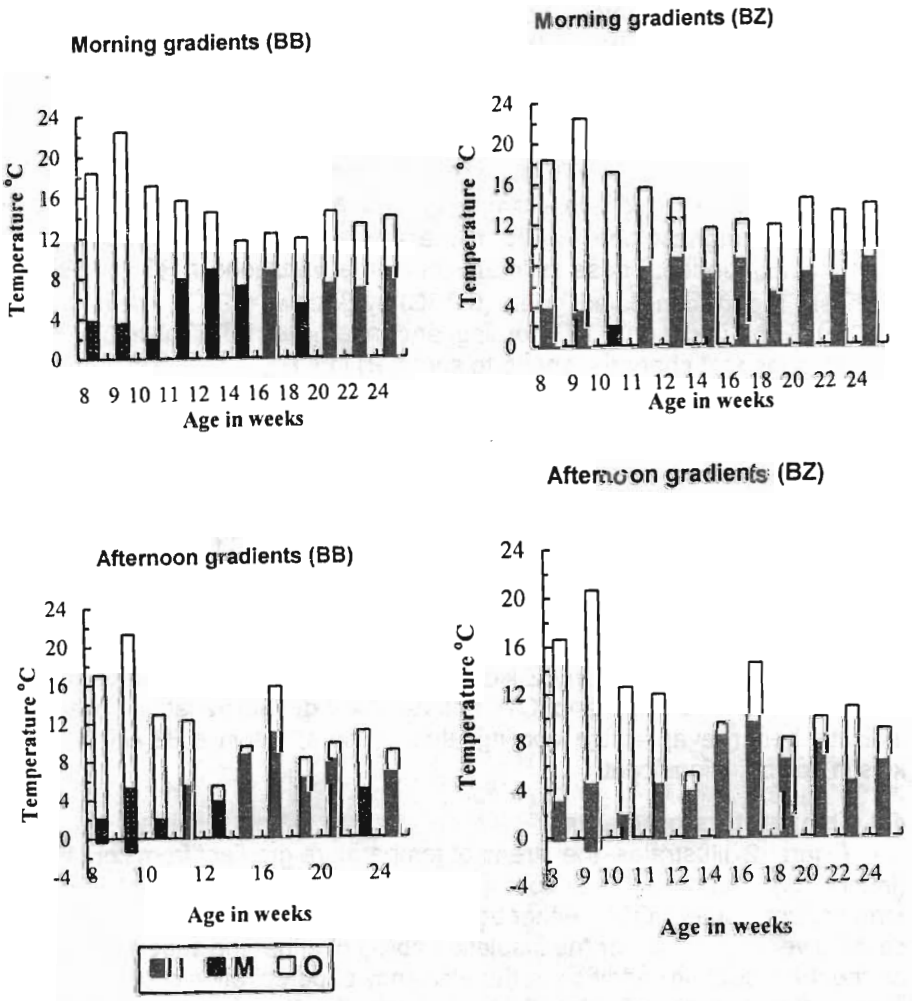

Figure 2: Temperature gradients (inner: I, middle: M, and outer: O) of Barki (BB) and Barki x Zaraibi (BZ) kids through 8 to 24 weeks of age.

The difference was insignificant, but might indicate that BB kids reduce the afternoon OG as a means to conserve water that would be lost in evaporative cooling. Gurgis *et al.* (1992) demonstrated that camels reduced their OG under hot summer conditions to prevent heat passage from the external environment indicating the insulation capacity of their coat. This mechanism was also encountered by Yousef (1985); Abdel-Khalik (1997) and Badawy *et al.* (1999). Barki goats developed some features that help in coping with the heat of summer, cold of winter and water shortage. However, Zaraibi kids proved to be able to withstand these harsh conditions.

4.4. Respiration Rate per minute (RR):

Age affected (P<0.01) RR as well as other physiological parameters (Table 5). Diurnal rhythms in RR were found to follow that of AT. Minimum values of RR at 8 a.m. were 16.50 and 19.69 breath / min. for BB and BZ kids, respectively. The corresponding maximum values at 2 p.m. were 55.50 and 44.13 breath / min, respectively. The overall magnitudes of diurnal increase in RR from 8 a.m. to 2 p.m. were found to be 9.62 (40%) and 7.45 (31%) for BB and BZ kids, respectively. These results however were of low magnitude. El-Sherbiny *et. al.* (1983) on Egyptian Balady goats and Dahlanuddin and Thwaites (1993) on Beetal goats reported that the mean RR increased significantly from 66.2 to 162.2 breath / min as AT increased from 25 to 40 °C. Also, Shalaby and Johnson (1993) found that RR of Anglo-Nubian goats increased by about 150% from early morning (AT, 25 °C) to noon (AT, 35 °C).

In conclusion, the present results showed that mating Barki does to Zaraibi bucks improved reproductive performance as indicated by increasing twining rate, average litter size and the number of weaned kilograms per doe bred. In addition, the results showed the ability of (F1) BZ kids to control body temperature under the new environmental conditions to be comparable to that of BB kids without need to increase respiratory evaporation mechanism.

Table 6: Analyses of variance for different temperature gradients

Source	DF	Mean squares					
		IGM	MGM	OGM	IGA	MGA	OGA
Breed (B)	1	0.026	6.063 *	3.759 *	0.261	1.267	0.084
Error a	27	1.317	40.739	1.906	0.573	0.851	1.074
Age (A)	10	118.2 **	330.19 **	666.6 **	199.4 **	69.67 **	698.7 **
B*A	10	2.106 *	0.6342	2.445	0.945	1.842 **	1.953 *
Error b	208	1.090	1.1810	1.747	0.637	0.718	0.895

IGM = inner gradient morning, MGM= middle gradient morning, OGM = outer gradient morning, IGA = inner gradient afternoon, MGA= middle gradient afternoon, OGA = outer gradient afternoon, * = P < 0.05, ** = P < 0.01,

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الخلط بين الماعز الزرايبى و البرقى ، الأداء التناسلى للإناث ، نمو و تأقلم جداء الجيل الأول للظروف البيئية

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أجرى هذا البحث ضمن مشروع تحت عنوان (إدخال ماعز الزرايبى عالية الإدرار إلى المناطق حديثة الاستصلاح) يهدف إلي تحسين إنتاج اللبن من الماعز تحت الظروف القاسية السائدة فى الصحارى المصرية، وذلك عن طريق استخدام سلالة الزرايبى أو النوبى المعروفة بتفوقها على جميع سلالات الماعز المصرية فى إنتاج اللبن. تضمنت خطة المشروع تربية سلالة الزرايبى بصورة نقية و خلطها مع سلالة الماعز البرقى المنتشرة بمنطقة صحراء الساحل الشمالى الغربى. و يهدف هذا الجزء من الدراسة إلى التعرف على الكفاءة التناسلية للإناث البرقى عند تلقيحها بذكور زرايبى ، كما تضمنت الدراسة إلقاء الضوء على معدلات النمو و مدى تأقلم جداء الجيل الأول للظروف المناخية للمنطقة. نفذت الدراسة بمحطة بحوث مريوط التابعة لمركز بحوث الصحراء الواقعة جنوب غرب الإسكندرية. استخدم ٢٥ أنثى ماعز برقى تم تلقيحها بذكور من نفس السلالة لانتاج جداء برقى (BB) ، كما استخدم ٢٧ أنثى برقى أخرى تم تلقيحها بواسطة ذكور زرايبى لانتاج جداء خليط جيل أول (BZ). كما تم تلقيح عدد ١٠ إناث زرايبى بذكور من نفس السلالة لانتاج جداء زرايبى (ZZ) والحفاظ على السلالة بصورة نقية.

أظهرت الماعز البرقى الملقحة بذكور زرايبى نسبة أكبر فى الولادة التوأمية (٢٩,٦%) بالمقارنة بأقرانها التى لقحت بذكور برقى (١٢,٠%). كان متوسط حجم الولادة ١,٣٨ لمجموعة BZ بينما كان ١,٠٧ لمجموعة BB. أيضا كان عدد الكيلوجرامات المولودة لكل أنثى دخلت الموسم أعلى في مجموعة BZ (١,٦٣ كجم) عن مجموعة BB (١,٤١ كجم).

فيما يخص معدلات النمو كانت مجموعة الجداء ZZ هى المتفوقة على المجموعتين BB و BZ وكان وزن الفطام ٧,٧٥ و ٥,٧٠ و ٤,٦٤ كجم على التوالى.

ارتفع معنويا المتوسط العام لحرارة الجسم ظهرا فى الجداء BB (٤٠,٠٧ °م)عن الجداء BZ (٣٩,٩٣ °م) بينما انعكس الحال بالنسبة لمتوسط درجة حرارة غطاء الجسم صباحا (٣٣,١١ مقابل ٣٣,٤٧ °م). أظهر ارتفاع التدرج الحرارى من الجلد الى غطاء الجسم فى الجداء BB أفضلية صفات العزل الحرارى لهذا الغطاء عما فى الجداء BZ. عموما لم تسجل فروق معنوية فى درجات حرارة الجلد ومعدلات التنفس صباحا أو ظهرا.

أظهرت الدراسة أن الخلط بين الماعز الزرايبى و البرقى أدى إلى التحسين فى الأداء التناسلى للإناث من حيث نسبة أكبر فى الولادة التوأمية ، متوسط حجم الولادة و كذلك عدد الكيلوجرامات المولودة لكل أنثى دخلت موسم التلقيح كما يتضح من نتائج هذه الدراسة قابلية الجداء BZ لتحقيق الاتزان الحرارى للجسم تحت الظروف المناخية السائدة فى مناطق صحراء الساحل الشمالى الغربى. كما تشير النتائج إلى إمكانية تربية سلالة الزرايبى فى هذه المنطقة.