Egyptian J. Anim. Prod.(1994) 31(1):85-97.

IMPROVING PERFORMANCE OF DESERT BARKI KIDS BY CROSSING WITH ZARAIBI AND DAMASCUS GOATS

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SUMMARY

The present study was carried out on 910 records of Barki (B), Zaraibi (Z), Damascus (D) kids and the different crosses obtained through mating the D and the Z bucks to the B does. All kids were kept at Bourg El-Arab Experimental Station, Ministry of Agriculture, Egypt, during the period from 1980 to 1988.

The effects of genotype, type of birth, parity and year of kidding on body weights at birth, weaning and marketing,as well as, pre and post weaning daily gain and pre-weaning mortality rate were studied.

The D kids had the heaviest body weights and higher weight gains. The D.B. kids were heavier and attained more gain than the Z.B kids. Males were heavier than females and singles were heavier than twins or triplets. Birth, weaning and marketing weights increased with increasing parity up to 3rd or 4th parity.

Pre-weaning mortality rates among the D and Z kids were 10.8 and 6.7%, respectively, more than that of the B kids. Meanwhile, mortality rate of D.B. crossbred kids were 2.4% less than that of D purebred, yet B.DB crossbred kids performed generally much better in pre-weaning mortality.

With the exceptions of the effects of sex on each of birth weigh and pre-weaning gain, parity on both marketing weight and post-weaning gain and type of birth

Issued by Egyptian Society of Animal Production.

on post-weaning gain, all traits were significantly affected by the different factors studied.

First and backcrosses over weighed local breeds (B or Z) D.B crossbreds kids performed generally better than Z.B crossbred reflecting the superiority of D blood.

In view of the obtained results it may be recommended to use D bucks for improving B goats.

Keywords: Sheep, goats, crossing, kids performance

INTRODUCTION

Goats are raised in the North Western Coastal Zone of Egypt mainly for their kid yield. Prolificacy of does together with survivalability of kids are both limiting factors for obtaining high number of marketable kids.

Barki desert goats are characterized by low kid performance, slow growth rate and poor milk production (Haider,1982). However, does of this breed are characterized by their ability to breed more than once per year, good ability to rear their kids, good kid livability and good adaptability to the desert area (Aboul-Naga et al., 1985).

The present work was established to study how kid output of the main goat breed i.e. Barki could be improved through crossing with a distinct local breed known for good milking and high prolificacy i.e. Egyptian Nubian (Zaraibi) or by introducing blood of a more developed breed which can with stand the prevailing conditions of the desert as well as good kid performance (Damascus goat).

MATERIAL AND METHODS

Records of birth, weaning and marketing weights of 146 Barki (B), 309 Zaraibi (Z), 225 Damascus (D), 52 Z.B, 80 D.B, 32 B.ZB and 66 B.DB kids were used in the present study. The kids were raised at Bourg El-Arab Research Farm, Ministry of Agriculture, located in the Coastal Zone of the Western Desert. Data were collected along the period from 1980 to 1988.

Management and feeding of the animals is accomplished as reported by Haider et al. (1994).

The pre-weaning daily gain (gm/day) was calculated as the difference between birth weight and weaning weight at eight weeks of age divided by 56 (number of days from birth to weaning).

The post-weaning gain was also calculated as the difference between weaning weight and live weight at six months of age as daily gain.

Data were analysed by least-squares method with unequal subclass numbers (Harvey,1977).

A fixed effects model was assumed to underlay each observation in each trait of body weight and growth rate of kids. This model reads

$Y_{ijklmn} = U+A_i+B_j+C_k+D_l+R_m+(AC)_{ik}+(CD)_{kl}+(RC)_{mk}+e_{ijklmn}$, where

Y_{ijklmn} = The observation taken on the nth kid, born to the doe in the mth parity, and this kid is of the lth type of birth, the kth sex, born in the jth year of kidding and is of the ith genotype,

U = Overall mean,

A_i = Effect of the ith genotype group,

B_j = Effect of the jth year of kidding,

C_k = Effect of the kth sex of kid,

D_l = Effect of the lth type of birth,

R_m = Effect of the mth parity of dam,

AC_{ik} = The interaction between breed and sex of kid,

CD_{kl} = The interaction between sex of kid and its type of birth,

RC_{mk} = The interaction between parity of dam and sex of kid,

e_{ijklmn} = A random error assumed to be independent normally distributed with mean = O and variance = $\sigma^2 e$

Another fixed effects model was used in the analysis of mortality rate of kids. It resembles the previous model, but without any interaction term.

Significant differences among means were detected using Duncan's multiple range test. Phenotypic correlation among different body weights of kids were also calculated.

RESULTS AND DISCUSSION

I- Body weights

Table 1 shows that genotype had significant effects on body weight of kids at birth, weaning and marketing

Damascus kids were the heaviest at all stages of age followed by kids of the first cross (DxB), then by the (BxDB) crossbreds. These results could be attributed to the heavier weight of D breed. Both Barki and Zaraibi purebred kids were approximately of similar body weight particularly at birth and weaning. Barki slightly exceeded Zaraibi at marketing age but the difference was not significant.

Table 1. Analysis of variance (mean squares) for body weight, weight gain and pre-weaning mortality of kids.

Source of		Weights (Kg)			Gain (g/day)		Pre-weaning
variance	df	Birth	Weaning	Marketing	Pre-weaning	Post-weaning	mortality
Breed of kid (B)	6	21.27**	99.91**	283.36**	0.006**	0.192**	0.260
Sex (S)	1	0.69	9.55*	84.25**	0.001	0.050*	0.085
Type of birth(T)	2	6.09**	19.29**	30.47**	0.002*	0.020	0.333
Parity(P)	6	1.01**	5.58*	4.58	0.003***	0.023	0.449**
Year(Y)	8	6.06**	5.91*	22.24**	0.005**	0.044**	0.856**
B X S	6	1.05**	2.11	17.40**	0.001	0.032*	
S X T	2	0.21	2.11	2.75	0.003	0.012	
P X S	6	0.38	2.13	2.05	0.001	0.011	
Error		0.35	2.63	3.65	0.001	0.013	0.505
		(872)	(660)	(396)	(660)	(396)	(886)

Figures within parentheses are error degrees of freedom.
* Significant at ($P<0.05$).
** Significant at ($P<0.01$).

It could be observed that kids of the first or back crosses were generally heavier than purebred Barki or Zaraibi kids.

In agreement with the present results, Castillo et al. (1976), Haider (1982), Singh et al. (1984), Aboul-Naga et al. (1985), Nagapal and Chawla (1985), Wilson (1987), El-Kimary and Abdelsalam (1988) and Ruvuna et al. (1988), who noticed that different breeds of goats varied in their body weights recorded at various stages of their life, the more improved breeds of goats and the crossbreds being always heavier.

Male kids were heavier than females at each stage of age, the differences in body weight between male and female kids steadily increased with advancement of age to reach 18 % at marketing (Tables 1 and 2). Similar findings were reported by Haider (1982), Aboul-Naga et al. (1985), Malik et al. (1986) and Farina et al. (1990) who found that sex was an important source of variation in body weight of kids at birth, weaning and marketing, and that males exceeded females in their body weight at the same age.

Kids born as twins were lighter than singles but significantly ($P<0.05$) heavier than triplets at the different stages of life (Table 2). A significant effect of type of birth on weights of kids was also reported by Sharma et al. (1981), Singh et al. (1984), Wilson (1987) and Ruvuna et al. (1988).

Body weight of kids increased progressively with increasing parity of dam up to the 3rd parity for birth and 4th one for both weaning and marketing weights and declined of afterwards (Table 3). This may be due to that older does lose their ability to withstand the effects of multiple pregnancies and lactations (Wilson,1987).

Differences in body weight of kids due to parity of the dam were significant at birth and weaning ($P<0.05$), but insignificant at marketing age (Table 1). Table 1 shows that year of kidding had a significant effect on each of birth weight ($P<0.01$), weaning weight ($P<0.05$) and marketing weight ($P<0.01$)

The significant year to year variations in kid weight at different stages of life could be due to changes in nutritional, climatic and management conditions from one year to another, as reported by Malik et al. (1986), Wilson (1987), El-Kimary and Abdelsalam (1988) and Roy et al. (1989).

The (breed x sex) interaction had a significant effect on birth and marketing weights, ($P<0.01$), while (sex X type of birth) or(parity X sex) interactions had insignificant effects on all weights studied (Table 1).

Phenotypic correlations between birth weight and each of weaning and marketing weights were positive and highly significant (0.26 and 0.12, respectively). The correlation coefficient between weaning and marketing weight was 0.51. Similar findings were obtained by Mukundan and Khan (1981), Malik et al. (1986) and Wilson (1987).

II- **Growth rate**

Genotype significantly affected pre-and post-weaning

Table 2. Least-squares means (±S.E.) of body weight daily weight gain and mortality of kids classified by Sex and type of birth

	Weights (kgs.) Birth			Weaning			Marketing		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
Sex of kids									
Male	472	2.52^{a}	0.10	356	7.80^{a}	0.30	222	15.28^{a}	0.35
Female	438	2.29^{a}	0.12	342	6.88^{b}	0.36	212	12.93^{b}	0.35
Type of birth									
Single	414	2.71^{a}	0.01	331	7.98^{a}	0.15	211	14.85^{a}	0.23
Twin	433	2.49^{a}	0.05	324	7.49^{a}	0.15	195	14.17^{a}	0.24
Triplet&over	63	2.21^{b}	0.17	43	6.99^{b}	0.52	28	13.29^{b}	0.45

	Gain (g/day) Pre-weaning			post-weaning			Pre-Weaning mortality %		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
Sex of kids									
Male	356	90^{a}	0.01	222	369^{a}	0.02	472	30.99^{a}	0.04
Female	342	83^{a}	0.01	212	312^{b}	0.02	438	27.10^{a}	0.04
Type of birth									
Single	331	91^{a}	0.004	211	354^{a}	0.01	414	23.88^{a}	0.03
Twin	324	85^{b}	0.004	195	331^{a}	0.01	433	27.44^{a}	0.03
Triplet&over	43	84^{b}	0.007	28	338^{a}	0.03	63	35.83^{a}	0.05

Means in the same column with different letters differ significantly ($P<0.05$) from each other.

Table 3. Least squares means (±SE) of body weight, daily weight gain and mortality of kids classified by parity of dam

Parity of dam	Weights (kgs.) Birth			Weaning			Marketing		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
1	229	2.39^{a}	0.08	172	7.28^{a}	0.26	89	13.39^{a}	0.27
2	241	2.49^{a}	0.08	211	7.27^{a}	0.25	137	13.98^{a}	0.28
3	167	2.62^{a}	0.08	127	7.57^{a}	0.25	93	13.76^{a}	0.28
4	122	2.26^{a}	0.09	88	7.68^{a}	0.29	68	14.11^{a}	0.35
5	82	2.44^{a}	0.10	52	7.66^{a}	0.34	22	13.89^{a}	0.46
6	34	2.49^{a}	0.13	25	7.44^{a}	0.42	43	13.56^{a}	0.70
7 & over	35	2.33^{a}	0.20	23	9.91^{a}	0.56	15	15.08^{a}	0.83

Parity of dam	Gain (g/day) Pre-weaning			Post-weaning			Pre-Weaning mortality %		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
1	172	90^{a}	0.01	89	317^{a}	0.02	228	21.65^{a}	0.40
2	211	85^{b}	0.01	137	340^{a}	0.02	241	20.88^{b}	0.40
3	127	96^{c}	0.01	93	317^{a}	0.02	167	23.75^{c}	0.40
4	88	94^{d}	0.01	68	310^{a}	0.02	122	30.41^{d}	0.40
5	52	96^{c}	0.01	22	298^{a}	0.03	82	39.04^{e}	0.50
6	25	93^{e}	0.01	10	355^{a}	0.04	35	25.12^{f}	0.80
7 & over	23	68^{f}	0.01	15	394^{a}	0.05	35	42.48^{g}	0.80

Means in the same column with different letters differ significantly ($P<0.05$) from each other.

daily weight gain of kids (P<0.01) (Table 1). The highest daily gain was attained by D kids during the pre-and post-weaning periods (Table 4). B kids had the lowest gain during the pre-weaning period, yet Z kids were the lowest in growth rate during the post-weaning period.

Table 4. Least-squares means (± S.E.) of body weight, daily weight gain and mortality of kids classified by genotype

	Weights (kg.)								
	Birth			Weaning			Marketing		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
Overall mean	910	2.41	0.08	698	7.34	0.24	434	14.10	0.24
Breed group									
Pure breeds									
Barki (B)	146	2.09^{a}	0.09	119	6.20^{a}	0.26	62	12.6^{ab}	0.32
Damascus(D)	225	3.06^{b}	0.09	161	9.05^{b}	0.27	89	17.45^{a}	0.32
Zaraibi (Z)	309	2.10^{a}	0.08	233	6.30^{a}	0.23	147	10.93^{b}	0.25
First cross									
D.B	80	2.55^{ab}	1.10	60	7.81^{ab}	0.30	30	15.56^{ab}	0.41
Z.B	52	2.56^{ab}	0.12	43	7.08^{ab}	0.36	43	13.16^{ab}	0.42
Backcross									
B/DB	66	2.28^{a}	0.11	57	7.48^{ab}	0.33	39	14.83^{ab}	0.43
B/ZB	32	2.18^{a}	0.14	25	7.48^{ab}	0.43	24	14.72^{ab}	0.50

	Gain (g/day)						Pre-Weaning mortality %		
	Pre-weaning			post-weaning					
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
Overall mean	698	86	0.01	434	341	0.01	910	29.04	0.04
Pure breeds									
Barki (B)	119	75^{a}	0.01	62	305^{a}	0.02	146	24.3^{a}	0.04
Damascus(D)	161	96^{b}	0.01	89	401^{b}	0.02	225	35.11^{a}	0.04
Zaraibi (Z)	233	78^{c}	0.01	147	243^{c}	0.01	309	31.03^{a}	0.03
First cross									
D.B	60	91^{d}	0.01	30	397^{d}	0.02	80	32.70^{a}	0.05
Z.B	43	83^{e}	0.01	43	304^{e}	0.02	52	24.61^{a}	0.06
Backcross									
B.DB	57	92^{f}	0.01	39	370^{f}	0.02	66	21.33^{a}	0.07
B.ZB	25	89^{g}	0.01	24	366^{g}	0.03	32	34.44^{a}	0.08

Means in the same column with different letters differ singnificanty (P<0.05) from each other.

Growth rates of D.B and B.DB crossbred kids were better than those of Z.B and B.ZB ones (Table 2),a matter which reflects the beneficial effect of using D bucks in crossbreeding. The pre-and post-weaning daily gain of all crossbred kids were better than those of either B or Z purebred kids. Similar results were reported by Morand-Fehr (1981), Devendra and Burns (1983) and Ruvuna et al. (1988) when crossing different breeds.

Growth rates of males excelled those of females. However, differences were only significant during the post-weaning period (Table 2). Similar finding were reported by Seth et al. (1968), Bhaduala (1979) and Malik et al. (1986). The post-weaning daily gain of male kids was significantly ($P<0.05$) higher than that of female ones, the advantage was over 18%. Ruvuna et al. (1988) reported significant effect of sex of kid on post-weaning growth rate.

Single born kids had higher pre-and post weaning growth rate than either twin or triplet born ones (Table 2). However, twin and triplet born kids had almost the same daily weight gain before and after weaning. The effect of type of birth was significant only on pre-weaning daily gain, but faded after weaning (Table 1). These result may due to a compensatory growth of twin and triplet born kids after weaning. High significant effect on pre-weaning gain due to type of birth was also reported by Sarma et al.(1981), Malik et al .(1986) and Ruvuna et al. (1988).

Parity of dam exerted a significant ($P<0.01$) effect on pre-weaning daily gain of kids but had insignificant effect on post-weaning daily gain (Table 1). This effect is a reflection of the dependence of the kid on his dam for milk supply. The pre-weaning growth rate of kids was generally better when their dams were in their 3rd to 5th parity (Table 3). Ruvuna et al. (1988) reported that age of dam significantly affected kid growth.

Year of kidding had a significant ($P<0.01$) effect on growth performance (Table 1). Pre-and post-weaning growth rates were highly variable among years and ranged from 63 - 103 grams per day and 271 - 417 grams per day, respectively, (Table 5). Haider (1982) and Ruvuna et al. (1988) found that year had a significant effect on growth performance.

All interactions had no significant effect on pre-and post-weaning daily gain except the (breed x sex) interaction which was found to have a significant effect on post-weaning daily gain.

Table 5. Least squares means (±SE) of body weight daily weight gain and mortality of kids classified by year of kidding

Year of kidding	Weights (kgs.) Birth			Weaning			Marketing		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
80	111	2.31^{a}	0.11	69	7.53^{a}	0.34	12	15.59^{a}	0.67
81	135	2.29^{a}	0.11	120	7.79^{a}	0.34	79	14.51^{ac}	0.43
82	88	2.28^{a}	0.11	61	7.40^{a}	0.36	46	15.18^{ac}	0.46
83	100	2.00^{a}	0.11	77	7.08^{a}	0.33	72	13.81^{ac}	0.37
84	124	2.56^{ab}	0.08	97	7.38^{a}	0.26	49	14.74^{ab}	0.35
85	90	2.02^{a}	0.10	72	7.57^{a}	0.31	43	14.00^{ab}	0.37
86	98	2.59^{ab}	0.10	90	7.54^{a}	0.28	61	13.80^{ab}	0.33
87	91	2.60^{ab}	0.10	63	7.19^{a}	0.30	39	13.19^{bc}	0.38
88	73	3.00^{b}	0.10	49	6.55^{a}	0.32	33	12.12^{b}	0.42

Year of kidding	Gain (g/day Pre-weaning			post-weaning			Pre-Weaning mortality %		
	No.	Mean	S.E.	No.	Mean	S.E.	No.	Mean	S.E.
80	69	99^{a}	0.01	12	417^{a}	0.04	111	44.78^{a}	0.06
81	120	103^{b}	0.01	79	340^{b}	0.03	135	20.66^{a}	0.06
82	61	86^{c}	0.01	46	390^{c}	0.03	88	39.61^{c}	0.06
83	77	96^{c}	0.01	72	358^{d}	0.02	100	29.50^{d}	0.06
84	97	86^{d}	0.01	49	362^{e}	0.02	124	22.21^{e}	0.05
85	72	82^{f}	0.01	43	331^{f}	0.02	90	28.24^{f}	0.05
86	90	83^{g}	0.01	61	312^{g}	0.02	98	09.94^{g}	0.05
87	63	84^{h}	0.01	39	258^{h}	0.02	91	34.27^{h}	0.05
88	49	63^{i}	0.01	33	271^{i}	0.03	73	32.23^{i}	0.05

Means in the same column with different letters differ significantly (P>0.05) from each other.

III- Kid mortality

Mortality rate of D kids from birth to weaning was 10.8% higher than that of the B kids, while for the Z kids it was only 6.7% more than that of B kids (Table 4). Higher mortality rate in D kids over that of Z and B kids was also reported by Aboul-Naga and El-Shobokshy (1981). Sharma et al. (1984), Tuncel (1987) and Murayi et al. (1987) reported that kid losses were highest during the pre-weaning period and varied greatly among breeds. However, differences in pre-weaning mortality of kids due to their genotype were not significant (Table 1).

Incidence of deaths in female kids was lower than that in males (27.10% vs 30.99%). Single kids had lower mortality percentages than twin kids, while the mortality rate tended to be higher in triplets than in twins (Table 2).

There were no significant differences in pre-weaning mortality rates due to sex of kid or type of birth (Table 1).

These results confirm the findings of Garcia et al. (1985) and Malik et al. (1990) who reported that mortality up to weaning tended to be higher for twins than for singles. Also, Misra and Rawat (1984) noticed the higher mortality rates among males than among females.

The highest percentage of losses were noticed at the 5th parity and oscillated afterwards while the lowest percentage were found at the first three parities. Mortality rate till weaning significantly ($P<0.05$) varied among parities and years (Table 1). The present results were in agreement with those of Haider (1982).

It could be concluded that the results obtained in the present study indicate that the use of Damascus bucks for improving Barki goats seems to be better than using Zaraibi bucks.

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تحسين اداء جديان الماعز البرقى الصحراوى بالخلط مع الماعز الزرايبى والدمشقى

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تمت الدراسة على ٩١٠ سجل لجداء الماعز البرقى الصحراوى والماعز الزرايبى المصرى والماعز الدمشقى المستورد وخلطانها. وقد تم تحليل البيانات بطريقة اقل انحراف ممكن لمعرفة اثر التركيب الوراثى والجنس ونوع الميلاد وعمر الام وسنة الميلاد على وزن الميلاد ، وزن الفطام ، وزن التسويق ومعدل النمو اليومى حتى عمر التسويق بالاضافة الى نسبة النفوق .

تفوقت الجداء الدمشقي على باقى التراكيب الوراثية فى الاوزان ومعدلات النمو اليومية وقد كان خليط الجيل الاول الناتج عنه تلقيح الدمشقى بالبرقى اثقل من نظيره الناتج عن خليط الزرايبى بالبرقى . كما تفوقت الجداء الذكور والجداء المولود فرادى فى اوزانها على الاناث والجداء الثنائية والثلاثية فى جميع مراحل حياتها ، ووجدت زيادة فى اوزان الجداء بزيادة عمر الام حتى عمر ٣–٤ سنوات.

كانت نسبة النفوق فى الجداء الدمشقى أعلى من مثيلتها فى الجداء البرقى بمقدار ١١٪ بينما كانت فى الجداء الزرايبى اعلى من البرقى بمقدار ٦,٩٪ ولكن كان اداء الجداء ١/٤ دمشقى افضل كثيرا فى نسبة النفوق ، وكانت نسبة النفوق فى خليط الجيل الاول مع الدمشقى اقل عنها عما فى حالة الجداء الدمشقى النقية اظهرت الدراسة ان جميع العوامل المدروسة كان لها تأثير معنوى على كل الصفات ماعدا تاثير الجنس على كل من وزن الميلاد ومعدل الزيادة اليومية قبل الفطام وكان لعمر الام تاثير معنوى على الوزن عند التسويق ومعدل النمو بعد الفطام اما نوع الميلاد فلم يكن له تاثير معنوى على النمو بعد الفطام ، كما وجدت اختلافات عالية المعنوية فى وزن الميلاد ووزن التسويق ترجع الى التداخل بين التركيب الوراثى والجنس وكانت معنوية فقط فى تاثيرها على معدل النمو بعد الفطام .

تفوقت جداء الجيل الاول وناتج التلقيح الرجعى فى اوزانها على السلالات المحلية كما تفوق خليط الدمشقى × البرقى على خليط الزرايبى × البرقى . دلت الدراسه على أن استخدام ذكور الماعز الدمشقى لتحسين انتاج الماعز البرقى كان افضل من استخدام ذكور الماعز الزرايبى كما حققت رواجا محليا افضل ويمكن نشرها على نطاق واسع من خلال برنامج تحسين .