Egyptian J. Anim. Prod. (2001) 38(2):129-141.

THE POTENTIALITY OF DHOFARI GOAT AS A MEAT PRODUCING ANIMAL

H. M. El-Gabbas[1] and M. R. Anous[2]

1. Animal Production Division, Desert Research Centre, Matareya, Cairo, Egypt., 2. Department of Animal Production, Faculty of Agriculture, Ain-Shams University, P.O. Box 68 Hadayek Shoubra, 11241 Cairo, Egypt.

SUMMARY

A total of 327 male and female kids of the Dhofari goat of Oman, comprising five ecotype groups, were used to investigate the effect of ecotype, sire, dam, sex, type of birth and year of birth on body weight, body dimensions and the body degree of muscling from birth to weaning. The possibility of improving the potentiality of meat production through mass selection based on either body weight or its dimensions was also considered. The effect of year of birth and dams within sire within ecotype followed by the ecotype were the most important sources of variation among the factors specified. However, sex and type of birth had no influence on the studied traits. Sires within ecotype showed some influences especially on body length. Generally, kids of the second year of birth were heavier, grew faster and had more body degree of muscling at weaning (P<0.001) than did the other kids. On the other hand, kids of Muscat region were the heaviest and biggest in size, while kids of Najd and the Western regions showed an opposite trend. Most of the genetic and phenotypic correlations among the studied traits were high and positive (P<0.01). Heritability estimates of body weight and measurements of body length and heart girth were also found to be higher, especially at birth, indicating the possibility of using such traits as early selection criteria for the body degree of muscling in Dhofari goat. It was also indicated that body weight and daily gain during the pre-weaning stage could be taken as good indicators for the body degree of muscling. Furthermore, mass selection based on body dimensions appeared to be more efficient than that based on body weight for improving both the body degree of muscling at weaning and daily gain of kids from birth to weaning.

Keywords: *Dhofari goat, body weight, body dimensions, degree of muscling, genetic parameters, selection.*

INTRODUCTION

Dhofari goat is the main breed dominates in Dhofar province in the southern part of Sultanate of Oman. Dhofari goat exhibits marked variations in colour, size and productivity. It was observed that animals of the east part of the province tend to be brown in colour, while animals in the west part are usually black. Animals grazing in Najd region are usually of pure white, whereas those of the central part are black and white. Hence, it was assumed that Dhofari goat has four ecotypes raised in different

parts of the province; Eastern Type, *ET*, Western Type, *WT*, Najd Type, *NT*, and Central Type, *CT*. Consequently, in 1991 when establishing the goat flock in the Livestock Research Station in Salalah, *LRS*, animals were brought from Bedouins scattered all over the province to represent these four ecotypes. Another group of Dhofari goat was brought from Muscat, about 1100 km north of Dhofar province. Ten years ago, Muscat Type, *MT*, was taken from Dhofar province and kept in Muscat as one breed group and probably went through various selection procedures. Does of *MT* were kept in *LRS* to be compared with the other four ecotypes previously mentioned. At *LRS*, data were collected from these five ecotypes regarding various productive and reproductive traits to evaluate the potentiality of such breed. Data of body weight and dimensions as well as some indexes of the body degree of muscling were made available to test the hypothesis of having various ecotypes in Dhofari goat and to explore the potentiality of such breed as a meat-producing animal. Various factors affecting these traits were also investigated together with the possibility of improving the degree of muscling in Dhofari goat through mass selection.

MATERIAL AND METHODS

Animals

The available data were collected for three successive years (1992, 1993 and 1994) where 90, 74 and 163 Dhofari kids were respectively born. These kids belonged to the five Dhofari ecotypes previously mentioned; *ET* (73), *WT* (43), *CT* (66), *NT* (77) and *MT* (68). The animals, which were the progeny of 28 sires, comprised of 162 females and 165 males, they were 245 single born kids and 82 twin born kids.

Management and measurements

Animals were maintained in the *LRS* at the same management and feeding system throughout the three seasons. Animals were fed on 0.5-0.75 kg concentrate/head/day according to their physiological status in addition to white clover hay ad libitum. Just after birth, kids were ear-tagged and their birth weights were recorded in kg., *Bwt*. Each kid was held in a normal standing position and measured at birth for body length, *Bbl*, height at withers, *Bhw*, heart girth, *Bhg*, and rear leg girth, *Brg*. Respectively, these measurements were recorded again at weaning as *Wbl*, *Whw*, *Whg* and *Wrg*. They were taken to the nearest 0.5 cm using a measuring tape as follows:

- Body length is the distance from the first thoracic to the last lumbar vertebra;
- Height at withers is taken from the top of the shoulder to the ground;
- Heart girth is the circumference of the body just behind the fore legs (at the level of shoulders);
- Rear leg girth is the circumference of the body just in front of the hind legs (at the level of hip bones).

Kids were kept to suckle their dams until weaning at approximately 3 months of age. Hay was provided to promote rumination. At weaning, body weight was recorded for each kid in kg., *Wwt*, as well as daily body gain from birth to weaning in gm., *DBG*. In the present study, live body degree of muscling, as a conventional objective, was expressed in two indexes as follows:

- Index(1); *I(1)*, was calculated as body weight/body length (kg/cm);

Index (2); *I(2)*, was taken as body weight/height at withers (kg/cm).

These two indexes were recorded at birth; *BI (1)* and *BI (2), respectively* and at weaning; *WI (1)* and *WI (2), respectively.*

Statistical analysis.

The data were subjected to the Mixed Model Least Squares and Maximum Likelihood Program (Harvey, 1990). The statistical model included the fixed effects of ecotype, sex, year of birth and type of birth as well as the random effects of sires within ecotype and dams within sire within ecotype.

A full-sib analysis was used to estimate genetic and phenotypic correlations and heritabilities for the traits considered in the study since heritability estimates obtained from half-sib analysis for some traits were found to be less than zero, probably due to the nature of the present set of data. The correlated response of a trait Y (CR_Y), when mass selection was applied on weaning weight or on measurements of body length or heart girth, was calculated according to Falconer (1960) as follows:

$$CRY = i*h_X*h_Y*r_G*\sigma_{P(Y)},$$

where: i is the intensity of selection; h is the square root of the heritability of the trait x and y; r_G is the genetic correlation between x and y; $\sigma_{P(Y)}$ is the phenotypic standard deviation of y.

RESULTS AND DISCUSSION

Variability of traits.

Table 1 showed that external body measurements, which reflect the skeletal development of the animals, are less variable in terms of CV% (ranged from 10.21 to 15.34) than body weights and degree of muscling indexes (ranged from 17.53 to 29.21). The highest variability was exhibited for the daily gain between birth and weaning (44.18%). Moreover, weaning traits appeared to be more variable compared with those traits taken at birth, except rear leg girth. The the skeletal development seemed to be less variable from birth up to weaning. On the other hand, higher variability attained in body weight, body daily gain and body degree of muscling might reflect the stage of development for these kids as well as their degree of muscling which characterizes the meat-producing animals (Preston and Willis, 1970).

Factors affecting traits.

Analysis of variance (Tables 2 and 3) indicated that ecotype had highly significant effect on body weight and various body measurements at birth and weaning. Year of birth had a marked effect on all studied traits, particularly at weaning. Sires within ecotype affected significantly *Bbl, Wbl, Bhw* and *Brg* whereas dams within sire within ecotype affected significantly *Whw, DBG* as well as each of body weights, heart girth and degree of muscling indexes either at birth or at weaning ages. The effect of dams might indicate the differences in mothering ability exhibited among various ecotypes. On the other hand, both sex and type of birth appeared to have approximately no effect on the studied traits.

Table 1. Arithematic means, standard deviations (SD) and coefficients of variation (CV%) for body weights, body measurements, degree of muscling traits and daily gain in Dhofari goat

Traits	Means	SD	CV%
Body weight at:			
Birth	3.01	0.59	
Weaning	8.97	2.62	19.60
			29.21
Body length at:			
Birth	30.86	3.34	10.82
Weaning	36.21	4.41	12.18
Height at withers at:			
Birth	33.98	3.47	10.21
Weaning	45.97	7.05	15.34
Heart girth at:			
Birth	37.50	4.15	11.07
Weaning	46.80	5.22	11.15
Rear leg girth at:			
Birth	36.33	5.19	14.29
Weaning	45.01	5.68	12.62
Index (1) at:			
Birth	0.097	0.017	17.53
Weaning	0.244	0.052	21.31
Index (2) at:			
Birth	0.088	0.017	19.32
Weaning	0.194	0.046	23.71
Daily body gain:			
Birth- weaning	52.47	23.18	44.18

Muscat type, *MT*, appeared to be heavier than other ecotypes at birth and weaning (Tables 4 and 5), which might due to the fact that this type had been raised in a governmental farm and probably being exposed to some selection procedures, since their ancestors were taken from Dhofar province 10 years ago. However, the lighter body weight of *NT* is expected since this ecotype was originated from the desert area of Najd. The remarkable ecotype effect attained on body weight and size might indicate that those kids probably came from different genetic origins and hence might act as different ecotypes. Different environmental factors in these regions (i.e. climate, nutrition, disease, etc) could be another factor involved. Differences in body weights and dimensions among goat breed types were reported elsewhere (Chawla *et al.*, 1984; Singh *et al.*, 1984; Sallam *et al.*, 1988; Mourad, 1993; Mourad and Anous, 1998).

Generally, kids born in the second season had higher growth rate as well as being heavier, bigger in size and have higher body degree of muscling particularly at

Table 2. Analysis of variance for body weight, body measurements, degree of muscling traits at birth and daily gain in Dhofari goat

Sources Of Variation	Degrees Of Freedom	Mean squares							
		Bwt	Bbl	Bhw	Bhg	Brg	BI(1)	BI(2)	DBG
Ecotype	4	1.2176***	70.2919**	131.353***	68.7932**	46.7642	0.00049	0.00021	693.8462
Sire:ecotype	71	0.2369	14.9677***	15.5984***	18.3155	29.0596**	0.00028	0.00026	409.8272
Dams:sire:ecotype	208	0.2487**	7.1196	8.2489	14.0242*	16.9735	0.00025**	0.00021*	434.6737***
Sex	1	0.0226	3.8972	9.5645	6.6613	0.4209	0.00001	0.00001	23.6982
Year of birth	2	0.0797	14.0525	3.8293	28.1234*	68.114*	0	0.00002	1782.687***
Type of birth	1	0.1353	0.5877	0.0839	7.2571	13.1951	0.00008	0.00015	2.5228
Remainder	39	0.1282	7.3879	6.4825	8.7195	16.8205	0.00013	0.00014	166.396

Bwt, birth body weight (kg); Bbl, birth body length (cm); Bhw, birth height at withers (cm); Bhg, birth heart girth (cm); Brg, birth rear girth (cm); Bl (1) and BI (2), birth degree of muscling indexes (kg/ cm); DBG, daily body gain from birth to weaning (g/d).
* Significant at P<0.05; ** Significant at P<0.01; *** Significant at P<0.001.

Table 3. Analysis of variance for body weight, body measurements and degree of muscling traits at weaning in Dhofari goat

Sources of Variation	Degrees of freedom	Mean squares						
		Wwt	Wbl	Whw	Whg	Wrg	WI(1)	WI(2)
Ecotype	4	18.492**	117.35***	94.370**	65.701**	122.73**	0.00248	0.00269
Sire:ecotype	71	4.7274	14.945**	26.1649	18.7215	25.0385	0.00173	0.00111
Dams:sire:ecotype	208	4.1279***	9.5048	21.952**	17.510**	19.006	.00185***	0.00145**
Sex	1	5.7046	10.7693	11.0324	1.1454	16.4261	0.0022	0.00136
Year of birth	2	46.310***	130.94***	200.61***	129.01***	157.40***	.01758***	.01837***
Type of birth	1	1.3569	13.2152	6.0997	33.0534*	18.4841	0.0000	0.00017
Remainder	39	1.7734	8.8823	10.5324	8.2099	13.9072	0.00074	0.00071

Wwt, weaning body weight (kg); Wbl, weaning body length (cm); Whw, weaning height at withers (cm);
Whg, weaning heart girth (cm); Wrg, weaning rear girth (cm); WI (1) and WI (2), weaning degree of muscling indexes (kg/cm).

* Significant at P<0.05; ** Significant at P<0.01; *** Significant at P<0.001.

Table 4. Least-square means# ±standard errors for body weights, body measurements, degree of muscling traits at birth and daily gain in Dhofari goat

Classification	Bwt	Bbl	Bhw	Bhg	Brg	BI(1)	BI(2)	DBG
Overall mean	2.9 0.03	30.5+0.24	33.9+0.42	37.3+0.39	36.2+0.55	0.096+0.001	0.086+0.001	54.5+1.43
Ecotype:								
Muscat	3.1 0.07[a]	32.2+0.83[a]	36.0+0.83[a]	38.4+0.76[a]	37.0+1.09	0.096+ 0.003	0.086+ 0.003	57.1+2.80
Central	3.0 0.06[a]	30.5+0.63[b]	33.9+0.64[b]	37.7+0.63[a]	36.9+0.85	0.098+0.002	0.089+0.002	57.6+2.70
Najd	2.8 0.06[b]	30.0+0.69[b]	32.4+0.70[c]	36.2+0.66[b]	35.4+0.92	0.092+0.002	0.085+0.002	50.7+2.62
Eastern	3.0 0.06[a]	30.3+1.07[b]	34.1+1.06[b]	38.0+0.91[a]	36.5+1.38	0.097+0.003	0.086+0.003	55.7+2.71
Western	2.9 0.08[b]	29.4+0.68[c]	32.9+0.69[c]	36.2+0.72[b]	35.1+0.93	0.097+0.003	0.086+0.003	51.2+3.33
Sex:								
Female	2.9 0.07	30.2+0.62	33.3+0.60	36.9+0.62	36.1+0.88	0.096+0.002	0.087+0.002	55.3+2.57
Male	3.0 0.07	30.8+0.61	34.4+0.59	37.7+0.62	36.3+0.87	0.096+0.002	0.086+0.002	53.7+2.55
Year of birth:								
First	2.8 0.13	28.6+1.06	33.0+1.00	35.3+1.12	33.3+1.56	0.097+0.004	0.085+0.004	36.7+4.81c
Second	3.0 0.15	31.6+1.20	34.1+1.13	40.3+1.28	40.9+1.78	0.095+0.005	0.089+0.005	77.7+5.50a
Third	3.0 0.13	31.3+1.01	34.5+0.96	36.2+1.07	34.3+1.49	0.096+0.004	0.086+0.004	49.1+4.59b
Type of birth:								
Single	3.1 0.14	30.8+1.15	33.7+1.09	38.4+1.22	37.6+1.70	0.099+0.005	0.091+0.005	55.1+5.27
Twins	2.8 0.15	30.2+1.17	34.0+1.11	36.2+1.25	34.7+1.74	0.092+0.005	0.081+0.005	53.8+5.40

Bwt, birth body weight (kg); Bbl, birth body length (cm); Bhw, birth height at withers (cm); Bhg, birth heart girth (cm);
Brg, birth rear girth (cm); BI (1) and BI (2), birth degree of muscling indexes (kg/ cm); DBG, daily body gain from birth to weaning (g/d).
Means in the same column with different superscripts differ at $p<0.05$

Table 5. Least-squares means[#] ± standard errors for body weight, body measurements and degree of muscling traits at weaning in Dhofari goat

Classification	Wwt	Wbl	Whw	Whg	Wrg	WI(1)	WI(2)
Overall mean	8.9 0.18	36.3+0.38	44.3+0.43	45.9+0.33	45.1+0.45	0.243+0.003	0.201+0.003
Ecotype:							
Muscat	10.0 0.35^{a}	38.6+0.75^{a}	46.2+0.85^{a}	47.6+0.64^{a}	47.1+0.89^{a}	0.251+0.006	0.211+0.005
Central	8.9 0.30^{b}	36.1+0.60^{b}	43.9+0.73^{b}	45.9+0.59^{b}	44.8+0.74^{b}	0.245+0.006	0.203+0.005
Najd	8.4 0.31^{c}	35.6+0.64^{b}	43.3+0.75^{c}	45.1+0.58^{b}	43.7+0.77^{c}	0.235+0.005	0.195+0.005
Eastern	8.8 0.40^{b}	35.9+0.94^{b}	44.5+0.98^{b}	45.9+0.69^{b}	45.6+1.07^{b}	0.244+0.006	0.199+0.005
Western	8.7 0.36^{b}	35.2+0.66^{c}	43.3+0.85^{c}	45.1+0.70^{b}	44.0+0.84^{c}	0.243+0.007	0.199+0.006
Sex:							
Female	8.5 0.28	35.8+0.62	43.7+0.69	45.7+0.58	44.4+0.77	0.236+0.005	0.195+0.005
Male	9.3 0.28	36.8+0.62	44.8+0.68	46.1+0.57	45.7+0.76	0.251+0.005	0.207+0.005
Year of birth:							
First	5.7 0.51^{c}	32.2+1.13^{c}	38.1+1.23^{c}	40.5+1.07^{c}	40.5+1.40^{b}	0.177+0.010^{c}	0.152+0.010^{c}
Second	12.3 0.58^{a}	42.9+1.29^{a}	45.2+1.41^{b}	51.5+1.23^{a}	52.3+1.60^{a}	0.298+0.012^{a}	0.279+0.011^{a}
Third	8.8 0.48^{b}	33.8+1.08^{b}	49.4+1.18^{a}	45.8+1.02^{b}	42.4+1.34^{b}	0.255+0.010^{b}	0.173+0.009^{b}
Type of birth:							
Single	9.4 0.55	37.7+1.23	45.2+1.35	48.2+1.17^{a}	46.8+1.53	0.244+0.011	0.207+0.011
Twins	8.5 0.57	34.8+1.26	43.3+1.38	43.6+1.20^{b}	43.3+1.57	0.243+0.011	0.196+0.011

Wwt, weaning body weight (kg); Wbl, weaning body length (cm); Whw, weaning height at withers (cm); Whg, weaning heart girth (cm); Wrg, weaning rear girth (cm); WI (1) and WI (2), weaning degree of muscling indexex (kg/ cm).

[#]Means in the same column with different superscripts differ at $p<0.05$.

weaning (Tables 4 and 5). Poorer performance of those kids in the first season might be attributed to the age of does which were younger than those in the other seasons. These results agreed with those reported by Mourad and Anous (1998) who found that kids born from older does had heavier body weight than those born from younger ones. Roy *et al.* (1997) also reported a pronounced effect for season on body weight of kids. Moreover, male kids tended to have heavier weights, bigger body size as well as higher degree of muscling and growth rate compared with female kids especially at weaning. Similar trend was also observed for the single born kids compared to the twins (Chawla, 1984; Mourad, 1993).

Relationships among traits

Table 6 revealed that body weight, at birth and weaning, generally had positive and significant genetic and phenotypic correlations with both body degree of muscling traits, expressed in terms of indexes, and daily gain, however negative correlations were obtained between *Wwt* and both *BI (1)* and *BI (2)*. Thus, heavier body weight at birth and weaning could be taken as a good indicator for the corresponding body degree of muscling at birth or weaning in Dhofari goat.

Daily gain during the pre-weaning stage could also be regarded as a good indicator for the body degree of muscling since it showed higher positive genetic and phenotypic correlations with the indexes reflecting the body degree of muscling, especially at weaning.

While body measurements had negative genetic and phenotypic correlations with the body degree of muscling indexes at birth; *BI (1)* and *BI (2)*, they showed higher and positive correlations, genetically and phenotypically, with the corresponding indexes at weaning; *WI (1)* and *WI (2)*. While body measurements also indicated positive correlations with daily gain, genetic correlations being generally higher than the phenotypic ones. Genetic and phenotypic correlations of body length and heart girth with body weights and the degree of muscling indexes appeared to be generally higher compared with the corresponding values of the other body measurements. It is impressive that the correlations of body length and heart girth measured at birth were higher with body weight and the degree of muscling indexes recorded at weaning compared with those recorded at birth. Generally, big-framed kids could also be taken as indicative criteria for blockiness (i.e. degree of muscling) in Dhofari goat. Out of these measurements, body length and heart girth would be of more importance in such context.

Phenotypic correlations of the present study agreed with those obtained on Alpine goat by Mourad and Anous (1991) who showed that body weight was well correlated with heart girth and body length. Other studies also indicated high correlations between body weight and body measurements (Yadav and Charan, 1995). Moreover, positive correlations among growth rate, frame size traits and body weight were also reported (Ozoje, 1997).

Heritability estimates obtained in table 6 were found to be high to very high and ranged between 0.72 to 0.95 for *Bwt, Bhw, Bhg, Wrg, BI(1), BI(2)* and *WI(2)*. Moderate estimates with a range between 0.35 to 0.46 were calculated for *Bbl, Wbl* and *Brg*. Similar findings were reported for body weight in goats (Mourad and Anous, 1998) and for body measurements in sheep (Bhadula *et al.* 1980).

Table 6. Genetic (above diagonal), phenotypic correlations (below diagonal) and heritabilities measurements, degree of muscling traits and daily gain in Dhofari goat.

Traits	Bwt	Wwt	Bbl	Wbl	Bhw	Whw	Bhg	Whg	Brg	Wrg	BI(1)	WI(1)	BI(2)	WFI(2)	DBG
Bwt	**0.91 0.2**	0.17	0.08	-0.2	0.42	-0.09	-0.08	0.04	-0.16	-0.2	0.85	0.25	0.76	0.24	0.34
Wwt	0.24	**0.12 0.2**	0.76	0.9	0.82	0.64	0.77	0.93	0.23	0.8	-0.22	0.94	-0.38	0.82	0.75
Bbl	0.32	0.59	**0.46 0.3**	0.74	0.34	0.65	0.69	0.79	0.18	0.59	-0.41	0.67	-0.75	0.50	0.76
Wbl	0.23	0.74	0.62	**0.39 0.3**	1.00	0.67	0.38	0.74	0.24	0.8	-0.57	0.67	-0.89	0.62	0.68
Bhw	0.27	0.63	0.68	0.56	**0.72 0.3**	0.74	0.93	0.92	0.27	0.75	-0.22	0.67	-0.25	0.51	0.16
Whw	0.15	0.60	0.44	0.51	0.50	**0.04 0.2**	0.59	0.78	0.06	0.63	-0.42	0.59	-0.60	0.21	0.41
Bhg	0.31	0.70	0.73	0.58	0.70	0.45	**0.81 0.3**	0.73	0.05	0.35	-0.46	0.84	-0.70	0.59	0.62
Whg	0.24	0.80	0.49	0.70	0.54	0.73	0.63	**0.02 0.2**	0.14	0.97	-0.34	0.92	-0.55	0.67	0.53
Brg	0.27	0.66	0.71	0.61	0.64	0.42	0.85	0.6	**0.35 0.3**	0.66	-0.75	0.18	-0.99	0.91	0.05
Wrg	0.07	0.69	0.47	0.60	0.54	0.46	0.58	0.69	0.57	**0.62 0.3**	-0.51	0.72	-0.70	0.59	0.65
BFI(1)	0.80	-0.14	-0.29	-0.16	-0.15	-0.13	-0.15	-0.08	-0.18	-0.12	**0.91 0.3**	-0.11	0.04	-0.03	0.01
WFI(1)	0.19	0.91	0.43	0.44	0.51	0.51	0.61	0.68	0.55	0.57	-0.11	**0.14 0.2**	-0.2	0.79	0.72
BFI(2)	0.81	-0.14	-0.08	-0.09	-0.32	-0.15	-0.11	-0.09	-0.10	-0.14	0.88	-0.12	**0.74 0.3**	-0.11	0.28
WFI(2)	0.20	0.85	0.44	0.59	0.44	0.15	0.58	0.54	0.56	0.54	-0.10	0.81	-0.07	**0.95 0.2**	0.66
ADG	0.07	0.51	0.28	0.35	0.29	0.23	0.35	0.37	0.32	0.30	-0.11	0.49	-0.09	0.49	**0.17 0.2**

Bwt, birth body weight (kg); Wwt, weaning body weight (kg); Bbl, birth body length (cm); Wbl, weaning body length (cm); Bhw, birth height at withers (cm);
Whw, weaning height at withers (cm); Bhg, birth heart girth (cm); Whg, weaning heart girth (cm); Brg, birth rear girth (cm); Wrg, weaning rear girth (cm); BI (1) and BI (2), birth degree of muscling indexes (kg/ cm); WI (1) and WI (2), weaning degree of muscling indexes (kg/ cm); DBG, daily body gain from birth to weaning (g/d).
(Correlations more than 0.11 are significant at 0.05 while those more than 0.15 are significant at 0.01)

In addition to the importance of body weight and measurements of body length and heart girth as indicators of the body degree of muscling from the correlations point of view, the heritability estimates of these traits were also found to be higher especially at birth (Table 6). This might indicate that body weight, body length and heart girth are heritable and there is advantages to utilize such traits as early selection criteria for the body degree of muscling in Dhofari goat. Therefore, table 7 calculated the correlated responses for the body degree of muscling indexes at weaning expected from selection on these traits; body weight, body length and heart girth measured at birth.

Mass selection

Table 7 revealed the correlated responses for both body degree of muscling indexes at weaning and pre-weaning daily gain expected from mass selection on body weight or on measurements of body length or heart girth, measured at birth and weaning. The response is indicated in the actual units of measure and as percentage from the original means of the unselected trait.

Table 7. Correlated response[+] for body degree of muscling traits at weaning and preweaning daily gain expected from mass selection on body weight or on measurements of body length and heart girth presented in absolute values (AbV) and percentages (%)

Selected Traits	Correlated traits					
	I (1)		I (2)		DBG	
	AbV	%	AbV	%	AbV	%
Bwt	0.0046	1.87	0.0102	5.24	3.07	5.85
Wwt	0.0063	2.59	0.0128	6.60	2.49	4.75
Bbl	0.0087	3.59	0.0152	7.82	4.91	9.36
Wbl	0.0080	3.27	0.0172	8.84	4.01	7.64
Bhg	0.0145	5.95	0.0237	12.21	5.30	10.11
Whg	0.6094	1.35	0.0042	2.16	0.71	1.34

I (1) and I (2), body degree of muscling indexes (kg/ cm); DBG, preweaning daily body gain (g/d).

[+]The selection differential of the selected trait was taken to be one phenotypic standard deviation.

Selection on birth weight, which is not recommended to avoid difficulties at kidding, led to a progress of 1.87, 5.24 and 5.85% in index (1), index (2) and pre-weaning body daily gain, respectively. Moreover, such progress in the body degree of muscling traits being more (2.59, 6.60 and 4.75%, respectively) when weaning weight was applied as a selection criterion. On the other hand, using measurements of body length and heart girth showed an increase in both the degree of muscling indexes (1 and 2) at weaning and pre-weaning body daily gain, particularly with the use of birth heart girth (5.95, 12.21 and 10.11%, respectively). Hence, regarding the magnitude of progress in the degree of muscling traits at weaning and also the pre-weaning body daily gain of kids, it appeared that mass selection on body dimensions,

particularly on heart girth and body length was more efficient than that attained when mass selection based on body weight.

In conclusion, Dhofari goat looks promising meat producing animal. However, due to lack of information on such breed, the present study dealt with the pre-weaning stage. While birth traits are important as early selection criteria, weaning traits are usually more important since most goat breeders select their kids at weaning or send them for fattening at that stage. For breeding purposes, using later traits might be recommended to provide more information on the capability of such breed for meat production. Furthermore, the outstanding feature of the present study is that Dhofari goat has five ecotypes, which call for further studies to characterize such ecotypes in more details. While the present study investigated the correlated responses in the body degree of muscling traits due to selection from within breed, the possibility of increasing the potentiality of meat production in Dhofari goat through crossing among these ecotypes might also be considered for future breeding programs.

REFERENCES

Bhadula, S.K., P.N. Bhat and R.G. Garg, 1980. Note on the estimates of heritability and phenotypic correlations of weight and linear measurements in Muzaffarnagari sheep. Indian J. Anim. Sci., 50: 573-575.

Chawla, S.D., S. Nagpal, and D.S. Bhatnagar, 1984. Variation in body-weight gain of Beetal, Alpine and Saanen goats. Indian J. Anim. Sci., 54:711-714.

Falconer, D.S., 1960. Introduction to Quantitative Genetics. The Roland Press Co. New York, N.Y.

Harvey, W.R., 1990. LSMLMW Mixed Least Squares and Maximum Likelihood Computer Program PC-2 Version. Dairy Sci. Department. The OH State Univ., Columbus, OH.

Mourad, M., 1993. Reproductive performance of Alpine and Zaraibi goats and growth of their first cross in Egypt. Small Rumin. Res., 12:379-384.

Mourad, M. and M.R. Anous, 1991. Effect of herd importation on reproductive and growth traits of Alpine goats in Egypt. Egypt. J. Anim. Prod.,28:169-178.

Mourad, M. and M.R. Anous, 1998. Estimates of genetic and phenotypic parameters of some growth traits in Common African and Alpine crossbred goats. Small Rumin. Res., 27:197-202.

Ozoje, M.O., 1997. Correlation analysis in purebred and crossbred West African Dwarf goats: growth and maturing patterns. Trop. Agric., 74:303-307.

Preston, T.R. and M.B. Willis, 1970. Intensive Beef Production. Pergamon Press. Oxford, New York, Sydney, Paris.

Roy, R., V.K. Saxena, S.K. Singh, and B.U. Khan, 1997. Genetic analysis of body weight at different ages in Jamunapari goats. Indian J. Anim. Sci., 67: 337-339.

Sallam, M.T., H.A. Hassan, and F.N.R. El-Feel, 1988. Crossing and some environmental factors effects on reproductive and growth performance of Egyptian Baladi and French Alpine goats. Minia J. Agric. Res. Dev., 10:1585-1606.

Singh, A., M.C. Yadov, and O.P.S. Sengar, 1984. Factors affecting body weights of Jamunapari and Barbari kids. Indian J. Anim. Sci., 54:1001-1003.

Yadav, S.K. and S. Charan, 1995. Growth performance of female kids under different management systems. Indian J. Dairy Sci., 48:174-176.

قدرات الماعز الظفارى كحيوان منتج للحم

حسنين محمد الجباس[1] و محمد رضا عانوس[2]

١- شعبة الإنتاج الحيوانى – مركز بحوث الصحراء – المطرية – القاهرة – مصر. ٢- قسم الإنتاج الحيوانى – كلية الزراعة جامعة عين شمس – ص. ب. ٦٨ حدائق شبرا- رمز بريدى ١١٢٤١ – القاهرة – مصر.

استخدمت فى هذه الدراسة ٣٢٧ من ذكور و إناث المعز الظفارى العمانية مكونة من خمسة أنواع جغرافية و ذلك لدراسة تأثير النوع، الأباء، الأمهات، الجنس، نوع الميلاد وسنة الميلاد على أوزان ومقاييس الجسم المختلفة بالإضافة إلى درجة الامتلاء العضلى للجسم وذلك من الميلاد وحتى الفطام. كما أخذ فى الإعتبار دراسة إمكانية تحسين إنتاج اللحم فيها باستخدام الانتخاب الكلى إما بالاعتماد على وزن الجسم أو مقاييس طول الجسم و محيط الصدر. و قد أوضحت النتائج أن أهم مصادر الاختلافات فى الصفات المدروسة كانت سنة الميلاد و النوع الجغرافى والأمهات داخل الذكور لكل نوع جغرافي بينما لم يكن للجنس أو نوع الولادة أي تأثير على الصفات المدروسة. فى حين أظهرت الذكور داخل النوع الجغرافي بعض التأثيرات خاصة على طول الجسم . و بصفة عامة، كانت المعز المولودة فى الموسم الثانى أثقل وزناً وأسرع نمواً وأعطت جسماً أكثر امتلاءاً بالعضلات عند الفطام (عند مستوى معنوية ٠.٠١) مقارنة بالمعز المولودة فى الموسمين الأول والثالث. وبينما كانت المعز التابعة لمنطقة مسقط أثقل وزناً و أكبر حجماً ، أظهرت المعز التابعة لكل من منطقة نجد و المنطقة الغربية اتجاهاً عكسياً. ومن ناحية أخرى، فقد كانت معظم الارتباطات الوراثية و المظهرية بين الصفات المدروسة عالية و موجبة (عند مستوى معنوية ٠.٠١). كما كانت تقديرات المكافئ الوراثى لوزن الجسم و مقاييس طول الجسم و محيط الصدر خاصة عند الميلاد أعلى من تقديرات الصفات الأخرى مما يشير إلى إمكانية استخدام هذه الصفات فى الانتخاب المبكر لصفة امتلاء الجسم بالعضلات فى المعز الظفارى . وقد تبين كذلك أن وزن الجسم ومعدل النمو اليومى يمكن اعتبارهما دليلا جيداً على درجة امتلاء الجسم بالعضلات فى الماعز الظفارى. كما أظهر الانتخاب الكلى المعتمد على مقاييس طول الجسم و محيط الصدر كفاءة أعلى من الانتخاب الكلى المعتمد على وزن الجسم و ذلك لتحسين كل من درجة امتلاء الجسم بالعضلات عند الفطام و معدل نمو الجديان من الميلاد و حتى الفطام .