GROWTH MEASURES OF LIBYAN GOAT BREEDS AND THEIR CROSSES

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ABSTRACT

This study was conducted at Bier- Alghanem Experiment Station, 80 km South West Tripoli. The aim was to assess the growth traits of Local breeds; Mahali (M), Targhi (T), Tibawy (Tb)); imported Breeds; Cyprus Damascus (D), Murciano Granadina (S)), Reciprocal Crosses of Local breeds, and crosses of Mahali breed with imported breeds. Traits studied included birth weight (BW), weaning weight (WW), yearling weight (YW) and daily gain until weaning (DGW). Analysis of variance (SAS GLM) was used to analyze the data. The model included: Year, type of birth, sex, and breed or type of crossing where all managed as fixed effects. The results indicated significant effect of year, sex and type of birth ($P < 0.05$). Local breeds showed no significant differences in pre-weaning traits but post weaning traits were significantly different ($P < 0.05$). The reciprocal crosses of local breeds and those of Mahali with imported breeds showed differences indicating maternal and genetic maternal effects. Large variation within the crosses indicated differences within each breed and that selection within pure breeds could improve the crosses.

Key words: *goat breeds, crossing, improvement*.

INTRODUCTION

The Libyan goat population is about 2 million heads. There are 3 distinct breeds of goat in Libya. The Mahali which is the predominant one, and comprises about 95% of the total population. Targhi and Tebawi breeds represent the remained 5% and mainly found in the southern parts of the county. Local goats are suitable habitat for mountain, arid and semi arid zones characterized with harsh environment and limited feed resources. These areas constitute large parts of the Libyan land. Goat meat is preferable by the Libyan consumer and ranks the second to mutton with tendency to increase in demand. The share of this animal in total local milk and meat production is low as estimated by less than 15%. The genetical improvement of the Libyan goat is needed to improve productivity and efficiency through exploitation of additive and non additive genetic variation. In 1998, the Ministry of Animal Wealth imported Damascus goat (Shami) from Cyprus and Murcaino- Granadina from Spain. The primary reason for importation was the potential genetic contribution they could offer for improving growth and milk production, considering the environment. **Louca et al. (1975) and Hadjipanayiotou and Louca (1976)** indicated that Damascus goat characterize with high milk production and prolificacy, and widely used in the Mediterranean countries as dual purpose breed.

While variation among breeds is to be used in a way to maximize productivity and efficiency of goat production, these breeds must be characterized for full spectrum of productive traits under a specific climatic and nutritional management environment. The aim of this study was to asses the growth traits of; local, imported, reciprocal crosses of local breeds, and crosses of Mahali breed with imported breeds and factors affecting these traits.

MATERIALS AND METHODS

This study was conducted at Bier- EL-ghanem Experiment Station, 80 Km South West of Tripoli. Data was collected for growth measures which included; birth weight (BW), weaning weight (WW), average daily gain until weaning (DGW), and yearling weight (YW). Purebreeds of Mahali (M), Tebawi (Tb), Targhi (T), Damascus (D) and Muraciano- Granadina (S) were maintained to provide contemporary data for comparison with the performance of the various crossbreeds. A series of crosses and various crossbreds were established employing local breeds, and Mahali with Damascus and Muraciano- Granadina. These crosses provided data for evaluating the potential usefulness of local crosses and that of exotic breeds under the local environment. The reciprocal crosses of local breeds were; (M×T, T×M, M ×Tb and Tb×M). Reciprocal crosses of Mahali with imported breeds; (M×D, D×M, M×S, S×M). These purebreeds and crossbreeds were reared and managed under the same condition at the Experiment Station. Two data sets were analyzed separately by the same model using analysis of variance with unequal subclass Numbers (GLM, SAS). Independent variables in the model were; year, sex of kid, type of birth, genetic group or crosses all as fixed effects. Dependent variables were birth weight (BW), weaning weight (WW), average daily gain until weaning (DGW), and yearling weight (YW). Duncan multiple range test was used for mean separation where effect was significant. Percentage of heterosis was calculated for each trait of each crossing.

RESULTS AND DISCUSSION

Means and standard errors for pure breeds and crossbreeds are in Tables 1. Summary of analysis of variance are presented in Table 2. Effects of year, sex of kid, type of birth and genetic group were significant on traits, but type of birth was not significant on yearling weight.

Birth weight (BW): birth weights of local breeds did not differ significantly from each other, and SS but were differed than DD. Birth weights of reciprocal crosses of local breeds were not significantly different. Sex, type of birth and year had significant effects on the trait ($P < 0.05$).The birth weight of MM was significantly differed from DD but not SS in favor of DD. The reciprocal crosses of DM and MD differed significantly (2.8 ± 0.26 and 3.5 ± 0.28 kg), indicating maternal effects in favor of the carrying mother (DD). These results were in agreement with **Abdelsalam et. al**. **(1994), Abuol-Naga et. al. (1985) and Magid et. al. (2007).**

MD had significantly the highest BW compared to the purebred DD but the reciprocal crossbred DM did not. The pure Mahali (M) did not differ significantly from DM but differed significantly from MD. Mahali did not differ from MS or SM. Generally, crosses of Mahali with Damascus were higher in birth weight than its crosses with Spanish breed Moratias grenadine, but difference of SM and MS was not significant. Using Damascus as mothers gave more birth weights in crosses with MM probably due to uterine environment or maternal and cytoplasmic genetic effects. This corresponds with **Magid et al. (2007).**

Weaning weight (WW): weaning weight is an important trait reflects mothering ability of the dam, genetic maternal effects and also additive individual effects, yet it is a suitable criterion for selecting mothers.

The local breeds of M, T & Tb did not differ significantly in weaning weight where all close to 11 kg. The reciprocal crosses of local breeds did not differ significantly in weaning weight. M*Tb was slightly higher in its weaning weight than other crosses and there was a difference between the M*Tb and Tb*M in favor of Tb as mothers. The % of heterosis was 16.8% as compared to 11.2 %. The weaning weights of reciprocal crosses were similar to the weaning weights of purebreds. The Damascus weaning weights were significantly higher than local breeds and their crosses. The effect of crossing was comparable with **Abdlesalam et al. (1994)** in crossing of Damascus with Barki and Zaraibi, And **Abuol-Naga et al. (1985)** in crossing Damascus with Nubi and Barki

Table1. Means and standard errors for growth measures of Genotypes studied.

Breed	B.W, kg	W.W, kg	DGW, gm/d	YW, Kg
Purebreeds:				
Mahali (M)	2.4 ± 0.08^{a}	11.2 ± 0.69^{a}	97.7 ± 7.6^{a}	21.2 ± 0.65^{a}
Targhai (T)	2.0 ± 0.07^{a}	9.8 ± 0.56^{a}	86.7 ± 7.2^{a}	22.6 ± 1.20^{a}
Tebawi (Tb)	2.1 ± 0.08^{a}	10.2 ± 0.89^{a}	98.7 ± 7.7^{a}	25.2 ± 1.50^{b}
Damascus(D)	3.6 ± 0.07^{b}	20.3 ± 0.80^{b}	158.0 ± 5.9^{b}	26.1 ± 0.82^{b}
Spanish(S)	2.6 ± 0.12^{a}	13.3 ± 1.10^{c}	118.0 ± 6.7^{a}	18.5 ± 1.10^{c}
Crossbreeds:				
T×M	2.5 ± 0.06^{a}	11.7 ± 0.57^{ac}	100 ± 500^{a}	24.2 ± 1.3^{b}
M×T	2.4 ± 0.09^{a}	11.6 ± 0.51^{ac}	100 ± 5.2^{a}	23.9 ± 1.1^{b}
Tb ×M	2.5 ± 0.08^{a}	11.9 ± 0.41^{ac}	102 ± 3.4^{a}	25.5 ± 1.5^{b}
M× Tb	2.5 ± 0.08^{a}	12.5 ± 1.2^{ac}	115 ± 12.0^{a}	26.1 ± 1.2^{b}
Mahali and its crosses with imported breeds.				
M×M	2.6 ± 0.17^{bc}	13.2 ± 1.4^{b}	85 ± 7.6^{a}	20.5 ± 1.4^{a}
D×D	3.8 ± 0.29^{a}	20.7 ± 1.2^{a}	139 ± 6.2^{b}	28.9 ± 0.84^{b}
S×S	3.1 ± 0.17^{abc}	13.8 ± 0.12^{b}	77 ± 7.7^{a}	19.0 ± 1.1^{a}
D×M	2.8 ± 0.26^{bc}	11.4 ± 0.49^{b}	68 ± 5.8^{a}	20.4 ± 1.1^{a}
M×D	3.5 ± 0.28^{a}	19.5 ± 2^{a}	135 ± 6.3^{b}	28.4 ± 1.2^{b}
M×S	2.9 ± 0.37^{abc}	14.0 ± 1.5^{b}	91 ± 16.1^{a}	17.8 ± 1.5^{c}
S×M	2.5 ± 0.20^{c}	11.9 ± 1.3^{b}	73 ± 7.3^{a}	15.7 ± 1.2^{d}

BW: Body weight, WW: Weaning weight, YW: Yearling weight, DWG: Daily weight gain

Crosses of Mahali with imported breeds:

Concerning weaning weight, MM was significantly different from DD in favor of DD (13.2 ± 1.4 compared to 20.7 ± 1.2 kg). MM was not significantly different from SS, MS, SM, and DM but was significantly different ($P < 0.05$) between the reciprocal crosses of DM & MD (11.4±0.94 and 19.5±2 kg). There was about 8 kg increase in favor of MD cross over DM. Heterosis in MD was 23.8% as compared to -27.6% for DM. The weaning weight of MD was very close to the purebred DD (19.5 ±2 to 20.7±1.2).The differences between reciprocal crosses of Mahali with Murcaino-Granadina were not significant. However, there was a large difference in the estimate of heterosis for each of the crosses which were 14.3% for SM compared to -7.3% for MS. Damascus does showed better mothering ability than Mahali does as indicated through differences between reciprocal in milk production, mothering ability and generally the additive maternal effects and cytoplasmic inheritance. The results of the crosses were generally comparable to **Magid et al. (2007)**, **Taskin et al. (2000)**, **Elzzaheri Ben Lakhel (2000)**, and **Fuentes Garcia et al. (1988)**. Large variation was noticed within the crosses which probably offset significance, and indicates that variation in the purebreds could suggest that selection in the pure breeds probably could improve crossbreds due to additive effects. A wide range of heterosis was noticed in various crosses which ranged from -27.6 to 23.8%.

It could be suggested that MTb, MD & MS probably will be advantageous if used in three way crosses as either dams or in the back cross.

Daily weight gain (DWG):

The weaning weight is composed of birth weight and weight gained after weaning. The pre-weaning daily gain reflects mothering ability. Also it had a component of individual additive effect.

Daily gain before weaning was similar for local breads of M, T & Tb where all were lower than the imported breeds of D & S. The reciprocal crosses of local breeds were similar with no significant difference, but MTb was higher than TbM (102 ± 3.4 as compared to 115 ± 12 gms/d). Heterosis was estimated by 30% for MTb compared to 15.3% for TbM. The large variation within crosses offset the significance. The average daily weights gained in the local crosses were higher than in the purebreds although was not significant. Mahali was significantly lower in DWG than DD& MD. The estimates of DWG in DD were lower than **Mavrogenis (1985)**, **Tasken et al. (2000)** and **Keskin and Bicer (2002).** DWG in SS were lower than in **Ezzahiri and Ben lakhal (1985)** for the same breed.

There is a significant difference in DWG between MM and DD ($P< 0.05$) but not significant with SS.

Table2. Effect of various factors on growth measures.

Traits	Year	Sex	Type of birth	Breed
BW	*	*	*	**
WW	*	*	*	**
YW	*	*	NS	*
DWG	*	*	*	*

* (P<0.05) ** (P<0.01) NS : not significant

There was no significant difference between reciprocal crosses SM and MS. The crossbred SM showed large variation in DWG. The reciprocal crosses DM and MD were differed significantly (P <0.01) (135 ± 6.3 compared to 68 ± 5.8 g/d, a difference of about 67 gm/d in favor of DD dams). The DWG of MD was not significantly different from the pure DD (135±6.3 compared to 139±6.2 gm/d). There were wide range of heterosis between crosses ranged from –37.5% for DM to 24% for MD. This is a more expressing for impact of mothering ability on weaning weight. The effects of crossing on DWG were comparable with Magid **et al. (2007)** and **Waldron et al. (1995).**

Yearling weight (YW): Although weaning weights in local breeds were not significantly different, there was a change in post weaning where Tb exceeded M and T and the difference was significant. The yearling weight is affected by weaning weights but kids after weaning are dependent on themselves, and reflect inherited additive effects. The performance of Tb in yearling weight suggests its use as sire for terminal crosses. The TbTb was close to DD in YW where difference was not significant. SS was significantly lower than the other breeds. The effects of sex, year and breed were significant but type of birth was not significant. Percentage of heterosis, measured for YW, was generally lower than those measured for weaning weights as being round 9%. The differences among reciprocal crosses were not significant. There was a significant difference between MM and DD (20.5±1 compared to 28.9 ±0.84 kg) but not for MM and SS. There was a difference between reciprocal crosses DM and MD which was significant at (P < 0.05). MD yearling weight was similar to the pure DD. SS and its reciprocal crosses were significantly lower in YW than other breeds and crosses which were in disagreement with **Waldron et al. (1995)** and **Oman et al. (2000)**. The trends of YW for MM crosses with DD were in agreement with **Magid et at. (2007)**.

Table3. Percentage of heterosis for various traits for crosses.

Crosses	BW	WW	DGW	YW
T×M	13.6	11.4	15.0	10.5
M×T	9.0	10.0	15.0	9.1
Tb ×M	11.0	11.2	15.3	6.7
M× Tb	10.0	16.8	30.0	9.2
D× M	-5.8	-27.6	-37.5	-13.7
M× D	17.6	23.8	24.0	20.1
M×S	14.2	14.3	11.8	-10.5
S× M	-1.6	-7.3	-10.3	-21.0

CONCLUSION

The Damascus breed indicates a potential to improve growth of the Mahali local breed. The relatively high variation within crosses that minimize the significance between them suggests that selection within pure breeds could improve crossbreeds and reduce these variations. The imported breeds should be evaluated and tested under local conditions and not used in crossbreeding programs based on their performance in the countries of origin.

The significant effects of sex, type of birth and year highlights the need for adjustment factors for proper evaluation and genetic comparison of pure breeds. The differences of reciprocal crosses suggest maternal effects and cytoplasmic inheritance differences.

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