

## **A Primary Investigation on Heritabilities of Growth Measures in the Magrabi Camel in Libya**

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### **ABSTRACT**

This investigation was carried out using 232 offspring of 12 sires. Traits studied were: Birth weight (Bwt.), body weight at six mos. (Bwt. at 6 mos.), average daily gain to six mos. (ADG to 6 mos.), yearling weight (YW), total gain after six mos., (TG 6 mos.), and average daily gain from six mos. till one year (ADG 6 mos. - 1 year). Heritabilities for these traits were estimated by the analysis of variance with unequal subclass numbers using data from 12 paternal half-sib groups. The offspring number per sire ranged from 4 to 88 with a mean of 16.7. The sire effects of these traits were significant at ( $P < .01$ ). Heritability estimates were:  $0.36 \pm .24$ ,  $.41 \pm .22$ ,  $1.08 \pm .42$ ,  $.40 \pm .22$  and  $1.2 \pm .47$  for Bwt., Bwt. at 6 mos., ADG to 6 mos., YW, TG 6 mos. and ADG 6 mos.- 1 year respectively. The phenotypic correlation between these traits were significant ( $P < .01$ ), and ranged from .06 to 0.96 for Bwt. With TG 6 mos. and Bwt. at 6 mos. with ADG 6 mos.- 1 year respectively. Heritability estimates were in the range of estimates in beef cattle and sheep and they indicate that considerable progress can be achieved though genetic selection for these traits.

**Key words:** Heratibility, Growth, Selection, Camel.

### **INTRODUCTION**

The main causes of phenotypic variation in all characteristics of economic importance are environment, heredity and the interaction between the two. Heritability may be defined as the fraction of phenotypic variance due to differences in additive genetic merit among individuals in a specified population. Reliable estimates of heritability for economic traits in camel are needed so that camel

breeder may determine the effectiveness of selection for these traits, and the best selection method to follow.

These estimates are necessary in determining how best to utilize records on the relatives of an animal, and in obtaining expectations concerning the merit of his progeny. To the best of our knowledge, data are lacking regarding heritability estimates for growth characteristics in camel (Barhat and Chowadry 1980, Shriram *et al.* 1977. This investigation was carried out to obtain estimates of heritability, and to study the effect of sires on growth measures of the Magrabi camel of Libya.

## MATERIALS AND METHODS

Growth records data of two hundred thirty-two offspring of twelve sires taken at El-Assa experiment station were used in this study. Data were recorded during poor grazing condition. The growth measures were: birth weight (Bwt.), body weight at six mos. (Bwt. at 6 mos.), average daily gain to six mos. (ADG to 6 mos.), yearling weight (YW), total gain after six mos., (TG 6 mos.), and average daily gain from six mos. till one year (ADG 6 mos, - 1 year). The analysis of variance with unequal subclass numbers was used with the following model:

$$Y_{ij} = M + S_i + E_{ij}$$

Where,  $Y_{ij}$  denotes each record of dependent variables,  $S_i$  is the random effect of  $i^{\text{th}}$  sire, and  $E_{ij}$  is the random error.

Means, standard deviations, coefficients of variation and product moment correlation were calculated for the mentioned growth measures. Heritability estimates were obtained using the following formula:

$$h^2 = [(t) .1/R]$$

Where,  $h^2$  is the heritability,  $R$  is the average coefficient of relationship among paternal half sibs, and  $t$  is the intra class correlation, (i.e.,  $t = \frac{2\sigma_s}{2\sigma_s + 2\sigma_w}$  where  $2\sigma_s$  is the between sire  $\sigma$  component of variance, and  $2\sigma_w$  is the within sire  $\sigma$  component of variance). The standard  $\sigma$  errors of heritability estimates were calculated as described by (Swiger *et al.*, 1964). Additive and

phenotypic standard deviations were calculated using the above mentioned components of variance.

## RESULTS AND DISCUSSIONS

Overall means, standard deviations, ranges and coefficients of variation are presented in (Table 1). Means were:  $35.2 \pm 0.3$ ,  $151.5 \pm 1.9$ ,  $648.3 \pm 153.6$ ,  $214.2 \pm 39.8$ ,  $59.1 \pm 24.6$  and  $333.1 \pm 121.4$  for Bwt., ADG to 6 mos., Yw, TG after 6 mos. and ADG 6 mos.- 1yr. respectively, phenotypic standard deviations, ranges indicate large phenotypic variation in these traits. Coefficients of phenotypic variation ranged from 12% for Bwt. to 44% for ADG 6 mos.- 1year suggesting differences in variability among different growth measures. The sire effects were significant on all measured traits ( $P < .01$ ) indicating real differences between sires of weighted animal.

Table 1: Means standard deviations coefficients of variation and ranges for growth measures.

Trait	Means $\pm$ SE	Range	PSD	C.V.%
Bwt. (kg)	$35.2 \pm 0.3$	22-47	4.2	12
Bwt. at 6 mos. (kg)	$151.5 \pm 1.9$	75-220	31.4	21
ADG to 6 mos. (gm)	$648.3 \pm 153.6$	273-1011	159.8	24.6
YW (kg)	$214.2 \pm 39.8$	108-308	49.1	22.1
TG 6 mos. (kg)	$59.1 \pm 24.6$	16-135	25.9	43.8
ADG 6 mos.- 1 year (gm)	$333.1 \pm 121.4$	35-638	146.9	44.0

PSD is the phenotypic standard deviation.

Heritabilities for growth measures are in (Table 2). These estimates were:  $.36 \pm .24$ ,  $.41 \pm .25$ ,  $.31 \pm .22$ ,  $1.08 \pm .42$ ,  $.40 \pm .22$  and  $1.2 \pm .47$  for Bwt., ADG to 6 mos., Yw, TG after 6 mos. and ADG 6 mos.- 1year respectively. Heritability estimates for Bwt., Bwt. at 6 mos., ADG to 6 mos. and TG after 6 mos. were intermediate and comparable to average estimates for similar measures in beef cattle and sheep (Warwick and Legates 1979 and Lasely 1978). Heritability estimates for older weights: YW and ADG 6 mos.- 1year were high but also comparable in tendency to the mentioned species. These estimates were inflated to above limits, probably reflect sire year partial confounding effects, and may indicate negative environmental trends across data which will be adjusted for using better modeling and analysis methods with accumulation of more data. The heritability estimates for traits from birth to six months were lower than other traits as indicated by coefficients of additive genetic variation (Table 2).

Table 2: Sire mean squares, heritability ( $h^2$ ) and coefficients of additive genetic variation for growth measures.

Trait	Sire MS	$h^2 \pm SE$	AGSD	PSD	CAGV %
Bwt. (kg)	42.1*	$0.36 \pm 0.24$	2.5	4.2	7.1
Bwt. at 6 mos. (kg)	2570*	$0.41 \pm 0.25$	20.1	31.4	13.3
ADG to 6 mos. (gm)	55809*	$0.31 \pm 0.22$	87.8	159	13.5
YW (kg)	11660.8*	$1.08 \pm 0.42$	49.1	46.7	22.9
TG 6 mos. (kg)	1676.7*	$0.40 \pm 0.22$	16.3	25.9	27.5
ADG 6 mos.- 1 year (gm)	12886.2*	$1.20 \pm 0.47$	165.3	146	49.6

\* $P < .01$ ; AGSD = Additive genetic standard deviation, PSD = Phenotypic standard deviation, CAGV = Coefficient of additive genetic variation.

It is most likely that these weights are dependent more on dams and to some extent are less affected by environmental trends. They reflect mothering ability and are best suited to be used as a detection criterion for female selection. However, yearling weights and average daily gain after six mos. were higher in additive genetic variability, and they are probably affected to a lesser extent by maternal effects, and thus can be considered suitable as a selection criterion for males.

The yearling weights are mostly marketing weights and economically very important to camel producers. Selection of males based on these weights will achieve a considerable amount of progress. Phenotypic correlations between Bwt. at 6 mos. and YW .79, Bwt. at 6 mos. and TG after 6 mos. .88 and between ADG to 6 mos. and YW .79 indicating large phenotypic association between Bwt. At 6 mos. and later weights. Body weight at six mos. can be considered a main selection criterion for females and as primary screening trait for male selection. (Table 3).

Table 3: Phenotypic correlation between growth traits.

Traits	Bwt. (kg)	Bwt. at 6 mos. (kg)	ADG to 6 mos. (gm)	YW (kg)	TG 6 mos. (kg)	ADG 6 mos.- 1 yr.(gm)
Bwt. (kg)	1	.40	.30	.35	.06	.12
Bwt. at 6 mos. (kg)		1	.96	.79	.35	.25
ADG to 6 mos. (gm)			1	.79	.35	.23
YW (kg)				1	.75	.76
TG 6 mos. (kg)					1	.88
ADG 6 mos.- 1 yr (gm)						1

## CONCLUSION

In conclusion, a large amount of variation exists in growth measures of the Magrabi camel. Heritabilities for these traits ranged from medium to high, which suggests that a considerable amount of improvement can be achieved by genetic selection for these traits in camel.

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