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Egypt. J. Anim. Prod. 19, No. 1, pp. 8 1-86 (1979

Heritability Estimates of Body Weight and Measurements of Fleisch Merino Lambs Raised under the Semi-arid Conditions

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RECORDS of Fleisch Merino lambs born at El-Salhia Sheep Breeding Station, Sharkia Governorate, during three consecutive years 1970—1972, inclusive, were analysed in order to estimate the heritability values of body weight and 6 body measurements at birth, 2, 3 and 4 months of age.

All heritability estimates of body weight were unexpectedly negative except that of body weight at three months of age (0.226). Estimates of heritability of body height at the four ages studied ranged from about 0.21 to 0.58. For body length heritability values ranged from a very low (0.085) or negative (-0.017) at birth and two months of age, respectively to about 0.44 at weaning time (4 months of age). Heart girth proved to be an appreciably heritable trait, except at two months of age. Heritability values were 0.277, — 0.060, 0.749 and 0.552 at birth, 2,3 and 4 months of age, respectively. Heritability estimates of thigh length were around 0.60 at the different ages except a -0.248 at birth.

Thigh circumference was moderately heritable with estimates of 0.246, 0.356 and 0.278 at 2, 3 and 4 months of age, respectively. Heritability values of loin width were 0.626, 0.321, -0.100 and -0291 at birth, 2, 3 and 4 months of age, respectively.

Body weight and body measurements of an animal are often considered important elements contributing to its efficiency as a meat producing animal. Knowledge of how much these traits are heritable is essential in planning to improve that efficiency. This study aimed at evaluating the heritability of body weight and some body measurements from birth till weaning in Fleisch Merino lambs raised under semi-arid conditions of Egypt.

Material and Methods

This investigation involved data on lambs born to a commercial flock of Fleisch Merino sheep during the period 1970-1972, inclusive. This flock was imported from the German Democratic Republic by the General Meat and Milk Organization since 1966 and located east of the Nile Delta at El-Salhia Breeding Station, Sharkia Governorate, a typically semi-arid region. Complete description of the flock and management practiced were given by Afifi *et al.* (1979). Records included in this study were 866, 398, 246 and 189 at birth, 2, 3 and 4 months of age, respectively.

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Data on body weight and body measurements of lambs, *viz.* body height, body length, heart girth, thigh length, thigh circumference and loin width at birth, 2, 3 and 4 months of age (weaning age) were first corrected for the effects of year of birth, sex and type of birth, using the constants obtained by Afifi *et al.* (1977) on the same flock. The corrected data were then subjected to half-sib analysis of variance and the components of variance among sires and within sires were calculated using the method suggested by Henderson (1953). Estimates of heritability were obtained as 4 times the paternal half-sib corre-lation. Standard errors of the heritability estimates were obtained according to Robertson (1959).

Results and Discussion

Heritability estimates and their standard errors of body weight and body measurements at the various ages studied are presented in Table 1.

Body weight

All heritability estimates of body weight, except that of body weight at the age of 3 months were unexpectedly negative and are therefore considered not different from zero. The values of heritability of birth weight in the three main local breeds (Ossimi, Rahmani and Barki) were found to range from 0.15 to 0.34 (Ragab *et al.*, 1953; Karam, 1959; Galal 1968 and Fahmi *et al.*, 1969). Heritability estimates of birth weight in different foreign breeds of sheep varied from 0.02 to 0.92 with most estimates were in the neighbourhood of 0.30 (El-Oksh *et al.*, 1962; Pekel, 1968; Yalcin, 1969; Dass and Acharya, 1970; Srinivasan, 1970; Burfening *et al.*, 1971 and others). The estimate of the heritability of 3- month body weight of the present study (0.226 $\pm$ 0.153) is relatively low when compared with the estimate of 0.346 reported by Radomeska (1973) on Kent (Romney March) sheep. Positive estimates of heritability of weaning weight (usually at the age of 4 months) in different breeds of sheep were reported to range from 0.04 to 0.77 with most estimates were in the neighbourhood of 0.35 (Warwick and Cartwright, 1957; Shelton and Campbell, 1962; Basset *et al.*, 1967; Yalcin, 1969 and others). The same applies for gain in weight during the suckling period as most heritability estimates previously reported in the literature were either low or moderate in value (Galal, 1968; Dass and Acharya, 1970 and Srinivasan, 1970).

On the other hand, negative heritability estimates were also reported to occur. Butcher *et al.* (1964) calculated the heritability of birth weight and obtained the negative values -0.17, -0.09, -0.29 and -0.11 in Corriedale, Hamp-shire, Shropshire and South Down lambs, respectively, using the intra-sire mu-ltiple regression. Also, when the same authors estimated the heritability of the same trait using the intra-sire correlation, they still obtained the negative values; -0.15, -0.35 and -0.05 in the Correidal, Hampshire and South Down lambs. They stated that the negative values of heritability obtained in their work were due to some factors which were not eliminated in their model of analyses. Thompson and Moore(1963) suggested that sampling error may cause negative estimates to heritability under certain conditions and that many negative estimates derived may result if the ana-lysis is based on the usual random model. The work of Gill and Jenson

TABLE 1. Heritability estimates of body weight and measurements of Fleisch Merino lambs at the four ages studied.

Traits	Heritability estimates at			
	Birth	2 months	3 months	4 months
Body weight	−0.423 ± 0.017	−1.736 ± 0.86	0.226 ± 0.153	−0.392 ± 0.229
Body height	0.211 ± 0.065	0.241 ± 0.118	0.582 ± 0.176	0.275 ± 0.389
Body length	0.085 ± 0.055	−0.017 ± 0.099	0.324 ± 0.160	0.437 ± 0.418
Heart girth	0.277 ± 0.075	0.060 ± 0.105	0.749 ± 0.185	0.552 ± 0.435
Thigh length	−0.248 ± 0.075	0.693 ± 0.143	0.608 ± 0.178	0.597 ± 0.442
Thigh circumference	−0.213 ± 0.009	0.246 ± 0.118	0.356 ± 0.162	0.278 ± 0.390
Loin width	0.626 ± 0.093	0.321 ± 0.123	−0.100 ± 0.123	−0.291 ± 0.258

(1968) showed that the probability of the occurrence of negative estimates of heritability derived from the variance among sires decreased with increasing the number of sires and the number of offspring per sire. They also suggested that using more information per sire instead of using more sires, appears to reduce the probability of obtaining negative estimates of heritability, especially if the true heritability is moderate or relatively, low. The negative heritability values of the present study may be explained by one or more of the factors reviewed above. Also it is worth mentioning that due to some limitations imposed on the present experiment, factors such as age and weight of dam were not included in the least squares model, thus did not permit correcting the data for these factors before being analysed. The negative heritability values obtained should not be taken as reliable estimates of the true heritability which calls for additional evaluation of heritability of these traits.

Body measurements

Estimates of heritability presented in Table 1 for body height at various ages studied fall within the range of 0.21 to 0.58. These estimates agree with that obtained by Taneja (1971) in the Marwari lambs (0.42) at birth.

On the other hand, the estimates of heritability of body length (Table 1) ranged from very low (0.058) or negative (-0.017) at birth and at two months of age, respectively to about 0.44 at weaning. Simillar estimates of heritability of body length at birth were also reported by Taneja (1958) in Peppin Merino (0.0) and in Marwari sheep (0.06) by the same author (1971), while much higher estimates of 0.42 and 0.51 were reported by El-Oksh *et al.* (1962) and Pekel (1968), respectively.

Heart girth of lambs measured at various ages studied proved to be an appreciably heritable trait, if heart girth measured at the second month of age was excluded (Table 1). The magnitude of heritability of heart girth suggests that selecting lambs on the basis of their heart girth measured at 3 and 4 months of age would be more effective than when done at either birth or two months of age. Other estimates of heritability of heart girth of similar magnitudes were previously reported by El-Oksh *et al.* (1962) at birth in Columbia-Rambouillet crossbred lambs, Pekel (1968) in Karman sheep and by Taneja (1971) in Marwari lambs at birth.

Thigh length (measured from the hip joint to the hock joint) was also a highly heritable trait with heritability values being in the neighbourhood of 0.60 at the different ages studied except an unexpected negative value at birth (Table 1). Thigh circumference (measured immediately opposite to the rear flank in the level of the belly was a half-way heritable as was. The thigh length with most estimates were in the neighbourhood of 0.30 at all ages studied except the negative value at birth (Table 1). The literature seems to be devoid of any estimates of heritability for thigh length and thigh circumference which makes it impossible to verify the present results and calls for additional estimates of heritability of such traits. Since both thigh length and thigh circumference represent the most valuable whole-sale cut in the lamb's carcass (leg of lamb) and with heritability values of the magnitudes reported above, it seems that these two traits would constitute a good criterion for selecting lambs for mutton production.

The estimates of heritability obtained in the present study for loin width (Table 1) were 0.626, 0.321,-0.100 and -0.291 at birth, 2.3 and 4 months of age, respectively. The estimate of heritability of loin width at birth was much greater than 0.29 obtained by El-Oksh et al. (1962) for the same trait or 0.36-0.38 obtained by Galal (1965) for hook-bone width at birth.

With the exception of loin width, heritability estimates of body measurements obtained in the present study tended to increase with the increase in age. This general observation suggests that the genotype of the animal with respect to these body measurements, plays an increasing role as the animal advances in age. Also, most estimates obtained with the exception of those taken at the 3 rd month of age, fall within the range of moderate or high values. Thus, individual selection alone could cause an appreciable amount of genetic progress for these traits.

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التقديرات الوراثية لوزن الجسم ومقاساته فى الأغنام المرينو
المرباة فى المناطق النصــف جافه

حســن العكش ، عزت عطا عفيفى ، أحمد الشرينى ، محـمـد توفيق رجـب
وغريب الصياد

زراعة الأزهر و كلية العلوم الزراعية ، بمشتهر وزراعة

شملت هذه الدراسة الحملان المـارينو المرباه بمحطة تربية الأغنام بالصالحية
محافظة الشرقية ـ والمولودة فى خلال ثلاث سنوات متتالية من ١٩٧٠ ـ ١٩٧٢
وذلك لتقدير المكافئات الوراثية لوزن الجسم وست قياسات لابعاد الجسم عند
الميلاد وعند عمر ٢   ٣   ٤ أشهر (الفطام)

كانت قيم المكافىء الوراثى لوزن الجسم سالبة على غير المتوقع فيما عـدا
الوزن عند عمر ثلاثة أشهر (٠ر٢٢٦) تراوح المكافىء لارتفاع الجسم عند
الأربعة أعمار المدروسة بين ٠ر٢١ و ٠ر٥٨ وكان المكافىء الوراثى لطول الجسم
منخفضا أو سالبا (٠ر١٧ الى ٠ر٠٨٥) عند الميلاد وعمر شهرين وذا قيم
متوسطة (٠ر٤٤) عند عمر الفطام ٠ أثبتت صفة محيط الصدر أنها مرتفعة
التوارث فيما عدا عند عمر شهرين بمكافىء وراثى قدره ٠ر٢٧٧ ـ ٠ر٦٠
٠ر٧٤٩   ٠ر٥٥٢ عند الميلاد ٤ ٣ ٢ أشهر من العمر على التوالى ٠ كانت
قيمة المكافىء الوراثى لصفه طول الفخذ فى حدود (٠ر٦٠) عند الأعمار المختلفة
فيما عدا عمر الميلاد (٠ر٢٤٨) ٠ أثبتت محيط الفخذ بأنه صفة متوسطة
التوارث وكانت قيم المكافىء لهذه الصفة ٠ر٣٤٦   ٠ر٣٥٦   ٠ر٢٧٨ عند
عمر ٢ ٣ ٤ أشهر من العمر على التوالى ٠ كان المكافىء الوراثى لعرض القطن
٠ر٦٢٦   ٠ر٣٢١ و ٠ر١٠٠ و ـ ٠ر٩١ عند الأعمار الأربعة على التوالى ٠