HERITABILITY ESTIMATES FOR GROWTH TRAITS IN THE IMPROVED BOER GOAT

J.F. ELS

Ministry of Agriculture Water and Rural Development, Livestock Research. Private Bag 13184, Windhoek. Republic of Namibia.

SUMMARY

Data on 1 517 kids born in the Omatjenne Boer goat stud between 1977 and 1986 was used for the estimation of heritabilities for birth-, weaning-, 6 month-, 9 month- and yearling weight. Heritabilities obtained in this study was compared with the estimates for South African sheep breeds. The estimate for yearling weight (0.35) is in accordance with that of the Dohne Merino (0.38) but lower than that of the Merino (0.45).
Keywords: Boer goat, heritability estimates

INTRODUCTION

In Namibia, goat farming is an integral part of the small stock industry. Devendra & Burns (1970) states that the Improved Boer goat is the only goat breed in the world specifically bred for meat production.

The potential for fast, effective genetic progress in a trait is among others dependant on the heritability of the trait and its genetic correlation with other traits. Thus, for any breed or flock, these estimates have to be made if an effective breeding plan is to be formulated: No heritability estimates are available for any traits of the Improved Boer goat with this in mind, this study was undertaken in the Omatjenne Boer goat stud, one of the oldest Boer goat studs in Namibia, to estimate heritabilities for birth -, weaning-, 6 month-, 9 month- and yearling weight.

MATERIALS AND METHODS

Data of 1 517 kids born in the Omatjenne Boer goat stud of approximately 288 breeding does between 1977 and 1986 was used for the estimation of heritabijities for birth-, weaning-, 6 month-, 9 month- and yearling weight. For each individual the following information was recorded; animal number, sire, dam, age of dam, year, mating season, previous production status of dam (did or didn't kid), level of previous production (if kidded, type of birth), sex of kid, type of birth, birth weight, weaning weight, 6 month weight, 9 month weight and yearling weight.

Due to animals being culled at different ages, the number of available animals decreased for the estimation of heritabilities for body weight at older ages (Table 1).

STATISTICAL ANALYSIS

Heritability estimates were obtained by using a single-trait derivative-free animal model REML programme (DFREML) of Meyer (1989). The same model was fitted on all five traits.

$$Y_{ijklmno} = \mu + A_i + B_j + S_k K + P_l + J_m + X_n + Z_o + e_{ijklmno}$$

where
$Y_{ijklmno}$ = individual animal record for the trait
μ = population mean of the appropriate trait
A_i = effecf of the i^{th} age of doe
B_j = effect of the j^{th} year
S_k = effect of the k^{th} mating season
P_l = effect of the l^{th} previous production
J_m = effect of the m^{th} level of prev. prod.
X_n = effect of the n^{th} sex of kid
Z_0 = effect of the o^{th} type of birth
$e_{ijklmno}$ = random error

The DVSLV1 programme was used for a uni-variate individual animal model. This programme allows estimates

TABLE 1: MAXIMUM-,MINIMUM -, MEAN WEIGHT, STANDARD DEVIATION, COEFFICIENT OF VARIANCE AND NUMBER OF RECORDS USED.

	Birth	Weaning	6 months	9 months	Yearling
Maximum weight	6.80	32.82	52.00	69.00	71.00
Minimum weight	2.10	8.00	12.00	15.60	20.50
Mean weight	4.42	17.80	22.71	30.00	36.91
SD	0.727	4.424	5.615	7.067	8.024
CV%	16.46	24.84	24.72	23.55	21.77
n	1 517	1199	1 023	839	725

Weaning weight adjusted to 100 days of age

Table 2 presents the variance components and heritabilities of the different traits.

TABLE 2: VARIANCE COMPONENTS AND HERITABILITY ESTIMATES FOR THE FIVE WEIGHT TRAITS.

	Birth	Weaning	6 months	9 months	Yearling
Add. gen. variance	0.12	8.27	10.54	9.65	8.85
Error varaince	0.22	5.47	6.97	14.47	16.05
Phenotypic variance	0.34	13.74	17.51	24.12	24.90
Heritability	0.36	0.60	0.60	0.40	0.36

of fixed effects fitted, to be obtained after variances have been determined.

RESULTS AND DISCUSSION

The mean values for the different traits (Table 1) are lower than those recorded by Campbell (1977,1984), probably due to the more extensive conditions under which the herd was maintained. The coefficient of variance for birth weight is much lower than that for the other traits, an indication of the smaller effect of environment on birth weight than on the other traits.

Heritabilities obtained in this study are compared with that of other sheep breeds, obtained under southern African conditions (Table 3). All these estimates were obtained by means of paternal half-sib analysis.

The heritabilitis for birth and weaning weight are higher than the estimates for the South African sheep breeds. Thus selection for weaning weight should result in good progress in growth rate.

TABLE 3: COMPARISON OF HERITABILITY ESTIMATES FOR DIFFERENT SOUTH AFRICAN SHEEP BREEDS AND THE BOER GOAT.

	Birth weight	Weaning weight	Yearling weight
1. Boer goat	0.3555	0.6021	*0.3555*
2. AFRINO	0.3040	0.2060	0.2230
3 Dohne Merino		0.2180	0.3920
4 Dohne Merino	0.2080	0.4540	0.3650
5 Dormer	0.0780	0.1240	
6 Merino	0.1090	0.2240	
7 Merino		0.4090	0.4050
8 Merino	0.3030	0.1240	
9 S.A.M.M	0.2130	0.0910	
10. Dorper	0.2610	0.2500	

S.A.M.M. = S.A. Mutton Merino

1. Present- study
2. Badenhorst (1989)
3. Laas(1982)
4. Fourie & Heydenrych (1982)
5. Van der Merwe (1976)
6. Heydenrych (1975)
7. Van Wyk (1982)
8. Wilke (1974)
9. Kotze (1976)-
10. Campbell (1974)

The estimate for yearling weight is more or less in accordance with that of the Dohne Merino (Fourie & Heydenrych 1982; Laas 1982) but lower than that for the Merino (Van Wyk, 1982). According to De Veer & Van Vleck (1987) the genetic differences between animals can be better expressed under intensive conditions, than under extensive conditions. Variance components between progeny of animals in favourable environments are larger than those of progeny of animals kept under less favourable conditions.

Heritability estimates under less favourable conditions should thus be lower than when estimated under favourable conditions. This can be the reason for the lower heritability of yearling weight.

REFERENCES

BADENHORST, M.A., 1989. Seleksiemaatstawwe by Afrinoskape. M.Sc Thesis University of Pretoria.

CAMPBELL, Q.P., 1974. A study of breeding problems in Dorper sheep. D.Sc Thesis. University of the Orange Free State.

CAMPBELL, Q.P., 1977. The Enabled Boer goat of South Africa. *Glen* Agric.6. 29-33.

CAMPBELL, Q.P., 1984. The National Mutton Sheep, Wooled Mutton Sheep and Goat Performance Testing Scheme. *Meat Board Focus* Apr, 1984. Vol.3, p.65

DE VEER, J.C. & VAN VIECK, L.D., 1987. Genetic Parameters for first lactation milk yields at three Production levels of herd production. J *Dairy Sci.* 70, 1434-1441.

DEVENDRA, G. & BURNS, M., 1970. Goat Production in the Tropics. *Technical Communication* Nr. 19.39.

FOURIE, A.J. & HEYDENRYCH, H.J., 1982. Phenotypic and genetic aspects of production in the Dohne Merino.II. Estimation of heritabilities of production traits. *S.Afr.J.Anlin.Scl.*12,61-64.

HEYDENRYCH, H.J., 1975. 'n Studie van kuddestatistieke, nie-genetiese faktore, genetiese parameters en seleksievordering met betrekking tot die Tygerhoek Merinokudde.Ph.D. Thesis, University of Stellenbosch.

KOTZE, F.DE K., 1976. Die teelstruktuur en 'n genetiese analise van die S.A.Vleismerino in Suid-Afrika.D.Sc Thesis, University of Pretoria.

LAAS, T.M., 1982. Faktore wat die produksievermoë van wolskape beïnvloed. D.Sc Thesis, University of Pretoria.

VAN DER MERWE, C.A., 1976. Genetiese en nie-genetiese faktore wat die produksie- en reproduksie-eienskappe van die Elsenburgse Dormerskaapkudde beïnvloed. D.Sc Thesis. University of Stellenbosch.

VAN WYK, J.B., 1982. Die beraming van fenotipiese en genetiese parameters by 'n kommersiële kudde Merino skape. M.Sc Thesis, University of the Orange Free State.

WILKE,D.P., 1974. Gelyktydige twee-rigtingseleksie vir wololie en wolkwaliteit by Merino skape. M.Sc Thesis, University of the Orange Free State.