ESTIMATES OF PHENOTYPIC AND GENETIC CORRELATIONS IN WEST AFRICAN DWARF GOATS

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ABSTRACT

Records on 848 West African dwarf goat kids and 220 kiddings over a period of eight years (1982-1989) were analyzed. The records were used to provide estimates of phenotypic and genetic correlations among parity, kidding interval, litter size at birth and body weight at various ages. Phenotypic correlation coefficients of +0.33 (P<0.01) and -0.17 (P<0.01) were obtained when parity was correlated with litter size at birth and kidding interval respectively. Phenotypic correlations among body weights were generally positive and significant (P<0.01). Parity was positively correlated (P<0.01) with body weight at the various ages except at 1 year (P>0.05). Litter size was, however, negatively correlated (P<0.01) with body weight at the various ages except at 1 year (P<0.05). The genetic correlations among body weights at various ages were positive and significant (P<0.01). Selection for body weight at an earlier age especially at 3 months is likely to result in improvement of yearling body weight.

Key words: Correlations, genetic, phenotypic, WAD goats

INTRODUCTION

The net value of an animal is dependent upon several traits that may not be of equal economic value and which may or may not be dependent on each other. For these reasons, it is usually necessary to select for more than one trait at a time especially when selecting for improved reproductive traits and body weight. Phenotypic and genetic indices are useful in selection programmes as the interaction between genotype and environment (Phenotype) largely determine an animal's productivity.

These estimates are readily available for cattle, poultry, swine and sheep (Dalton, 1985; Legates and Warwick, 1990) but are few for goats (Roy *et al.* 1989; Wilson *et al.* 1989; Mittal, 1988; Ngere *et al.* 1984; Taneja, 1982; Adu *et al.* 1979; Moulick *et al.* 1966). There is, however, no information on genetic correlations among traits of economic importance for the West African dwarf (WAD) goats. The objective of this study was to provide estimates of phenotypic and genetic correlations among reproductive traits and body weights of WAD goats at various ages.

MATERIALS AND METHODS

Kiddings and body weight records routinely collected between 1982 and 1989 from the Nigerian-Dutch research project 'Management of the West African Dwarf goat in the humid tropics' were used for this study. The project was carried out at the Goat Unit of the Obafemi Awolowo University Teaching and Research Farm, Ile-Ife, Nigeria. The herd history and management of the flock were as earlier reported by Ademosun (1988) and Odubote (1992). In summary the goats were sheltered and kept in complete confinement where they were given improved nutrition through the use of browse (Leucaena and Gliricidia) supplemented with salt lick. They were vaccinated against PPR and dipped against mange and lice. Mating was controlled thus inbreeding was guarded against.

Using the General Linear Model (SAS, 1986) to determine least squares means, the data were adjusted for the effects of sex, season and year of birth, parity and type of birth (Odubote, 1992.) The least squares mean for body weights at five stages of growth, kidding interval and litter size at birth had been provided earlier by Odubote and Akinokun, (1992). Pearson's correlation co-efficients were computed for: parity and litter size at birth;

parity and kidding interval; parity and litter size at birth with body weights at five stages of growth; and among the five body weights.

Sire groups were utilized in estimating genetic variances and covariances for body weight at various ages. Genetic correlations among body weight at various ages were thus estimated from the variance and covariance components of the analysis of covariance using the formula by Becker (1968) :

$$r_G = \frac{Cov(s)}{\sigma^2 s(x) . \sigma^2(Y)}$$

Where

σa	=	genetic correlations
Cov(s)	=	Sire component of covariance
$\sigma s^2(x)$	=	Sire component of variance for trait x
$\sigma s^2(Y)$	=	Sire component of variance for trait.

RESULTS AND DISCUSSION

Phoenotypic Correlation

Phenotypic correlation coefficients of +0.33 (P<0.01) and -0.17 (P<0.01) were obtained when parity was correlated with litter size at birth and kidding interval respectively. The positive correlation between parity and litter size at birth is in agreement with the observations of Adu *et al* (1979) and Ngere *et al* (1984). The parity effect, however, could have been confounded with changes in body weight of the does (Odubote *et al,* 1992). Changes in body weight of does over parities have been reported by Moulick *et al.* (1966) to be partly responsible for the larger litter size obtained.

The negative correlation between parity and kidding interval tallies with the conclusion of Levasseur and Thibault, (1980) that full reproductive efficiency is not attained in any specie at the first reproductive cycle. Thus, as parity increases, does are expected to mate and conceive readily. Reports are however, not available on the parity level at which full reproductive efficiency is attained. Such information would help a lot in culling programme for does of advanced parity level.

Table 3 shows the phenotypic correlations between parity, litter size at birth and body weights at five ages. Parity was positively (P<0.01) correlated with body weight at all ages except 52 week body weight. This is similar to the reports of Ngere and Mba (1982) and Ngere *et al* (1984). Thus for valid comparisons among kids and for selection purposes. the body weights must be corrected for parity effect. The negative correlations obtained between litter size and body weight at various ages is consistent with the few reports in the literature. It could be observed that the magnitude of the correlation co-efficient declined over the periods considered. This is not surprising because the kids, pre-weaning, mostly depend on the doe for their nutrition. Secondly, Akinsoyinu *et al* (1977) reported that milk yield of WAD goat was not directly proportional to the litter size but that it increased marginally. Thirdly, whatever maternal effect was experienced after weaning is largely a carry over effect.

The phenotypic correlations among body weights were positive and significant (P<0.01). Correlations among closely related body weights tended to be higher than with later ages. The lowest correlation co-efficient obtained was between birth and 1 year body weight which is similar to the reports of Hassan *et al* (1991) and Karam (1959) for Yankassa and Rahmani sheep respectively. The highest correlation coefficients obtained at an earlier age are those of weaning and 3 month body weight. It must be observed however, that the weaning weight is the closest to the 3 month body weight and these two traits also have very high -correlation co-efficient. Hence weaning weight or 3 month body weight would provide a basis for selection.

Genetic Correlation

Table 3 shows also the estimates of genetic correlations obtained among the five body weights. The genetic correlations were generally positive and high ranging from 0.38 to 1.24. The estimates were almost invariably higher than the phenotypic correlations. It was also observed that the genetic correlations showed a tendency to decline as the period intervening the weights being related increased. This was also the reports of Chopra and Acharya (1971), Acharya and Malik (1979) and Singh *et al.* (1984) in sheep.

Genetic correlations involving weaning and 3 months body weight were the highest. Thus reinforcing earlier argument that selection at such an earlier age will be beneficial. However, the low heritability estimate for weaning weight, 0.140±0.003 (Odubote and Akinokun, 1992) may reduce the effectiveness of the selection exercise. Thus, 3 month body weight with heritability estimate of 0.290±0.005 (Odubote and Akinokun, 1992) would be a better basis for selection.

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TABLE 1 PHENOTYPIC CORRELATIONS BETWEEN REPRODUCTIVE TRAITS AND BODY WEIGHT AT VARIOUS AGES IN WEST AFRICAN DWARF GOATS.

	BIRTH WEIGHT	WEANING WEIGHT	3 MONTH BODY WEIGHT	6 MONTH BODY WEIGHT	9 MONTH BODY WEIGHT	1 YEAR BODY WEIGHT
Parity	0.17**	0.18**	0.20**	0.26**	0.19**	0.13**
Litter size at birth	-0.34**	-0.17**	-0.30**	-0.19**	-0.16**	-0.09**

* P<0.05
** P<0.01

TABLE 2 GENETIC AND PHENOTYPIC CORRELATIONS AMONG BODY WEIGHTS OF WEST AFRICAN DWARF GOAT AT VARIOUS AGES.

	1	2	3	4	5	6
Birth Weight(1)		0.30**	0.51**	0.37**	0.31**	0.27**
Weaning Weight(2)	0.84**		0.68**	0.69**	0.54**	0.38**
3 Months body Weight(3)	0.64**	0.76**		0.72**	0.54**	0.35**
6 Months body weight(4)	0.98**	1.16**	1.24**		0.78**	0.53**
9 Months body weight(5)	0.38**	0.70**	0.63**	0.53**		0.78**
1 Year body Weight (6)	+	+	+	+	+	

[d] The phenotypic correlations are above the diagonal line while the genetic correlations are below.

+ The genetic correlation could not be computed due to negative sire component of variance

** P<0.01