

Phenotypic and genetic variation of fleece weight, fineness of fibre and its coefficient of variability in Peruvian alpaca



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Introduction

Alpaca fibre and fleece quality are crucial to the textile industry. Different parameters are used by the industry and the breeders in order to assess it: fleece weight (FW), fineness of fibre (FD) and the coefficient of variability of fineness (CV, a measure of diameter homogeneity).

There are two types of alpaca fleece, namely Suri (Figure 1 and 2) and Huacaya (figure 3 and 4) with different physical and textile characteristics.

While phenotypic and genotypic variation of wool and fleece characteristics are well known for sheep, there is limited information for both Suri and Huacaya alpaca.

Objectives

To determine phenotypic and genotypic variation of fleece and fibre characteristics in the alpaca species by means of analysis of covariance with focus on certain factors believed to affect fibre quality such as sex, fleece type (Suri or Huacaya), and age at first shearing.

Materials and Methods

The data were recorded from 450 alpaca, from an experimental herd in the Peruvian plateau ("Alpaquero Developing Centre" of Toccra, Arequipa, Caylloma Province). Fleece weight, fibre fineness and coefficient of fineness variability were measured. The alpaca specimens comprised 388 huacaya (217 males and 171 females) and 62 suri (34 males and 28 females), ranging from 119 to 371 days old. Data were analysed by means of analysis of covariance, using fleece type and sex as fixed factors and age at first shearing as covariate.

Results

The estimated mean values for fleece weight (covariate value of 297.01) are shown in Table 1. The estimated mean values for fibre fineness and coefficient of variability (covariate value of 288.3) are shown in Tables 2 and 3 respectively.

Sex, as well as its interaction with the fleece type, had no effect on the three traits. The fleece type had no effect on the fleece weight but had significant effect on both the fibre diameter and the fineness coefficient of variability ($P \leq 0.006$).

The estimated heritability values were: 0.10 for the fibre diameter, 0.19 for the coefficient of variation, and 0.37 for the fleece weight and are shown in Table 4 together with both genetic and phenotypic correlation coefficients. A significant genetic correlation was found for all the pair wise combinations of these traits.



Figure 1. Alpacas showing a Suri type of fleece

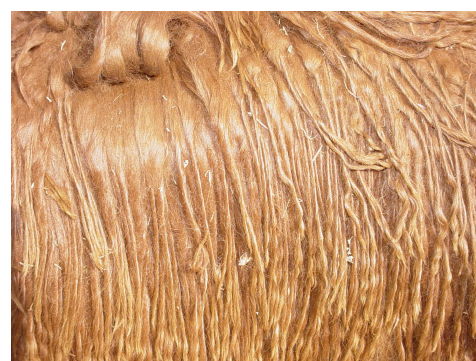


Figure 2. Detail of a Suri fleece



Figure 3. Alpacas with Huacaya type of fleece

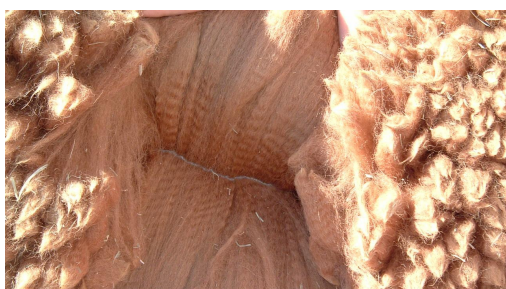


Figure 4. Detail of a Huacaya fleece

Table 1. Covariate analysis for fleece weight

Dependent Variable: Fleece Weight

Type of fleece	Mean	SD	95% Confidence Interval	
			Lower Bound	Upper Bound
H	1,472 ^a	0.28	1,441	1,504
S	1,458 ^a	0.30	1,330	1,586

a. Covariates appearing in the model are evaluated at the following values: giorni tosa = 297,01.

Table 2. Covariate analysis for fibre fineness

Dependent Variable: Fibre Fineness

Type of fleece	Mean	SD	95% Confidence Interval	
			Lower Bound	Upper Bound
H	20,098 ^a	2.03	19,896	20,301
S	21,084 ^a	2.04	20,576	21,592

a. Covariates appearing in the model are evaluated at the following values: giorni tosa = 288,33.

Table 3. Covariate analysis for coefficient of variability

Dependent Variable: Coefficient of Variability

Type of fleece	Mean	SD	95% Confidence Interval	
			Lower Bound	Upper Bound
H	20,319 ^a	4.294	19,890	20,748
S	22,337 ^a	4.291	21,267	23,408

a. Covariates appearing in the model are evaluated at the following values: giorni tosa = 288,33.

Table 4. Heritability values, genetic and phenotypic correlations

	FD	CV	FW
FD	0.10	0.82	0.58
CV	0.23	0.19	0.67
FW	0.23	0.02*	0.37

Table 4. Heritability values are shown in the diagonal, genetic correlations in the upper portion of the table and phenotypic correlation in the lower.

* Non significant correlation coefficient $P > 0.7$

Conclusions

This investigation is the first step towards the estimation of a genetic index for each of the 450 alpaca and the establishment of a selected nucleus to be used in a breeding programme aimed at improving quality and quantity of fibre within the experimental herd in Toccra.