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DIVERSITY AND BREED COMPARISON OF WOOL PARAMETERS IN 31 DIFFERENT AMERICAN AND EUROPEAN OVINE BREEDS

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Abstract: A study was designed aiming to establish phenotypic relationships between some American and European authoctonous sheep breeds. Data were collected from 1.203 animals from 31 ovines breeds or varieties belonging to different wool phenotypic branches (fine, entrefine and coarse): Blanca Colombiana (N=45), Criolla de Bolivia (N=82), Chiapas Blanca (N=48), Chiapas Café (N=51), Chiapas Negra (N=62), Crioula brasilera (N=52), Latxa chilena (N=88), Linca argentina (N=10), Mondegueira (N=28), Moro colombiana (N=27), Navajo Churro Café (N=29), Navajo Churro Negro (N=29), Oaxaca general (N=52), Oaxaca Mixteca (N=61), Socorro (N=48), Tarahumara (N=44), Zongolica (N=24), Castillonesa (N=30), Roja del Rossellón (N=15), Tarasconesa (N=18), Churra Badana (N=74), Churra Terra (N=30), Galega Mirandesa (N=40), Aranesa (N=27), Castellana Negra (N=4), Churra (N=25), Manchega Negra (N=63), Merino de Grazalema (N=44) Ripollesa (N=14) and Xisqueta (N=10). Ten quantitative wool characteristics as fibers length, amount of long, short and kemp fibers, average fiber diameter and its variation, and isoalcoholic degreasing percentage were investigated. To present data structure and relationship among poblational accessions, principal component analysis (PCA) and constrained Ward's cluster analysis were conducted over all the data. The PCA was carried out with the aim of obtaining an aggregation of variables exhibiting a pattern of joint contribution to the total variation. For the PCA, the correlation matrix was used. For the cluster analysis, a matrix of Gower's similarity coefficients was generated and constrained Ward's linkage method was performed. The wool parameters that appeared as more effective to define the first PC were the percentage of short fibers and kemp, kemp length and alcoholic yielding, whereas the F30 value (diameter fibers > 30 µm) defined the second PC. Mean fiber diameter appears useless as grouping criteria. The resulting for the cluster analysis does not allow the glipse of kown phylogenetic relationships amongst the studied breeds, but it illustrates of how loss of original wool productive orientation can affect the similarity of breeds indepently of their phylogeny.

Key words: fibre diameter, kemp, phylogeny, sheep, staple

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INTRODUCTION

There is little published information about comparative wool characteristics for some of the breeds investigated. Moreover, there have been conflicting reports in the literature regarding the relationships between some American and European breeds. In this paper, we present an analysis based on breed wool characteristics with a view to obtaining a deeper insight into relationships within and between breeds.

MATERIALS AND METHODS

Data were collected from 1,143 animals belonging to 31 autochthonous breeds or varieties from America and Europe. Each wool's characteristics were determined using standard methods (see Rojas et al., 2005) at the Wool Quality Laboratory at the Institute for Indigenous Studies, Universidad Autónoma de Chiapas (UNACH), in San Cristóbal de Las Casas, Chiapas (Mexico). Nine wool characteristics were investigated for each sample (Parés, 2008): fibre length (cm), percentage of each type of fibre (long-coarse fibres – outer-coat, short-fine fibres – inner-coat, and kemp), mean fibre diameter (µm), percentage of fibres > 30 µm (F30) and yield after scouring with alcohol (%). A principal component analysis (PCA) and cluster analysis were conducted. Character loading was used to determine the contribution of each variable to the first component vector. In order to organize breeds into feasible groups, a constrained method using Ward's method was utilized with data for most discriminative parameters. A principal coordinate analysis (PCoA) was finally generated from the correlation matrix. The scores of breeds for the first two components were projected. Different PAST – 'Paleontological Statistics Software Package for Education and Data Analysis' (Hammer et al., 2001) programs were utilized to perform all the analyses.

		N
ARANESA	ARA	18
BERBERINA	BER	15
BLANCA COLOMBIA	BCO	45
CASTELLANA NEGRA	CAN	4
CASTILLONESA	CAS	15
CHIAPAS BLANCA	CHB	48
CHIAPAS CAFÉ	CHC	51
CHIAPAS NEGRA	CHN	62
CHURRA	CHU	25
CHURRA BADANA	CBA	74
CHURRA TERRA QUENTE	CTQ	30
CRIOLLA DE BOLIVIA	CBO	82
CRIOULA BRASIL	CBR	52
GUIRRA	GUI	15
LATXA CHILENA	LAC	88
LINCA	LIN	10
MANCHEGA NEGRA	MAN	63
MER. GRAZALEMA	GRA	44
MIRANDESA	MIR	40
MIXTECA	MIX	61
MONDEGUEIRA	MON	28
MORA COLOMBIANA	MOR	27
NAVAJO-CHURRO	NAV	29
OAXACA	OAX	56
RIPOLLESA	RIP	14
ROJA MALLORQUINA	RMA	12
SOCORRO	SOC	49
TARAHUMARA	TAH	44
TARASCONESA	TAR	18
XISQUETA	XIS	10
ZONGOLICA	ZON	14

RESULTS AND DISCUSSION

Descriptive statistics for each breed are shown in the Proceedings. Inter-breed correlations for the entire population showed considerable variation (0.060 to 0.7129). There is significant variability among different breeds, which indicates a high response to selection. The plot of sample means on the first two principal components axes is shown in Fig. 1. Component 1, which explains 61.2% of the total sample variance, is the short fibre percentage, whereas Component 2, which explains 17.6% of the total sample variance, is the long fibre percentage and fineness.

According to the PCA, the primary source (PC1) of variation for the sample studied was the percentage of short fibres. Fibre diameter and percentage of long fibres are significant variables of PC2. Percentage of kemp fibres is the significant variable for PC3. These are then useful as grouping criteria, as indicated by some authors (Briggs, 1995; Maddever & Cottle, 1999). Scouring seems not to be an important discriminative parameter. Using the correlation matrix of the four most discriminative parameters (percentage of each kind of fibre, fibre diameter and F30), a dendrogram was obtained utilizing Ward's method (Fig. 2). As the figure shows, most of the breeds are grouped into three large clusters, with one isolated breed appearing (Chiapas Blanca) (see photo).

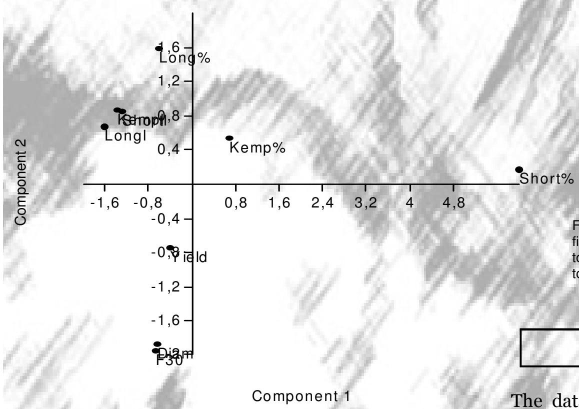

FIGURE 1. Plot of the sample means for nine wool parameters on the first two principal component axes. Component 1 explains 61.2% of the total sample variance, whereas Component 2 explains 17.6% of the total sample variance.

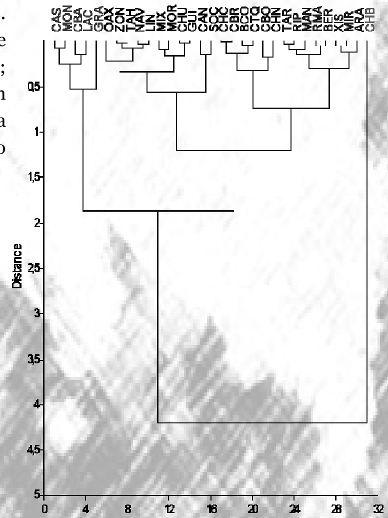

FIGURE 2. Constrained clustering (Ward's method) (coefficient correlation = 0.894).

CONCLUSIONS

The data reported here provide valuable insight into population and help in assessing inter-breed comparison, supporting the idea that the analysis of racial relationships is not necessarily linked to historical relationships. However, our results seem to determine different but more concise groups than those traditionally considered: Merino, Entrefino, Churro and Iberian stock.

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