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Morphological characterization of the Iberian pig branch based on quantitative traits

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SUMMARY - We describe the results from a study of 17 quantitative morphological variables for the characterization of the varieties forming the present Iberian Pig. The Analysis of Variance, the Canonical Discriminate Analysis and the Cluster analysis developed here have shown a different grade of differentiation amongst the studied varieties. We have found significantly different varieties as the Mahalanobis distances show, while other varieties are very close. This information was used to give a hypothesis about population structure of the Iberian Pig taking into account the quantitative morphological characteristics.

Key words: Swine, conservation, genetic resources.

RESUME - "Caractérisation morphologique de la branche du porc ibérique basée sur des caractères quantitatifs". Dans ce travail on décrit les résultats obtenus dans une étude de 17 variables morphologiques de nature quantitative menée en vue de la caractérisation des différentes variétés qui constituent le porc ibérique actuel. L'analyse de la variance entre variétés individualisée à chaque variable, l'analyse discriminante canonique et l'analyse de cluster réalisées, ont montré une très grande différenciation entre les variétés étudiées. Il y a des variétés très éloignées, d'après les distances de Mahalanobis, tandis que d'autres se trouvent très proches. Finalement, compte tenu de ces résultats, on propose une hypothèse pour expliquer cette structure de population d'après ses caractéristiques morphologiques quantitatives.

Mots-clés : Porc, conservation, ressources génétiques.

Introduction

A tendency to the concentration of domestic animal genetic resources in big racial groups exists in Spain. Examples of this are the cases of the Lebrijano Churro sheep and Grazalema Merino sheep breed, populations perfectly defined as independent breeds but in the past included in the big census of the Churro and Merino breeds, respectively. This fact placed them as a small native breed in risk of extinction (Rodero *et al.*, 1994).

The Iberian swine may be in a similar situation because these breeds are formed by several varieties presenting different developments in this moment.

AECERIBER, as a specific association of breeds is very disappointed of because loss of internal genetic variability produced by the concentration of the production in only a few varieties, leaving the others clearly endangered. This reaches a maximum in the Dorado Gaditano, Mamellado and Manchado de Jabugo (Aparicio, 1987).

The most important problem was that some of these varieties could disappear before being defined and characterized, along with the knowledge about the relationship among them were necessary.

Our team is presently working in this subject not only from the morphological point of view, but also from their productive and genetic (DNA markers) characteristics.

With our work we are trying to definitively define the complex populational structure of the Iberian pig breed. In this paper we are presenting our results from the analysis of the external body characteristics variability among varieties, based on quantitative morphometric traits.

Material and methods

566 adult animals (515 females and 51 males) belonging to the Iberian pig breed have been measured. The following 17 morphological traits were chosen by their power of discrimination in swine (Aparicio, 1987; López *et al.*, 1992).

These animals were classified into 9 varieties according to the recommendation of the association of breeders based on to historical, traditional and morphological concepts.

The Villalon and Manchado de Jabugo varieties were not included in this study because not enough pure animals were found in the sampling. The sample size was balanced with respect to the estimated total census for each variety. The Statistica 5.0 program for Windows 97 was used in the statistical analysis.

Result and discussion

In Table 1 the results of the analysis of variance among varieties with their correspondent of the Duncan test are shown. The underlined are defining homogeneity groups.

We can observe in this table how the Manchado de Jabugo variety has a tendency to distinguish itself from the other varieties showing independent homogeneity group in several variables.

Table 1. Analysis of variance among Iberian varieties

Variable	F	Level of signification	Homogeneity groups (Duncan)
Weight	11.63932***	0.000000	<u>Mc</u> <u>P</u> <u>S</u> <u>M</u> <u>E</u> <u>T</u> <u>R</u> <u>L</u>
Head width	1.49587 ^{ns}	0.166231	<u>Mc</u> <u>P</u> <u>S</u> <u>M</u> <u>E</u> <u>T</u> <u>R</u> <u>L</u>
Width between eyes	6.97790***	0.000000	<u>E</u> <u>M</u> <u>P</u> <u>Mc</u> <u>L</u> <u>R</u> <u>S</u> <u>T</u>
Width of snout	10.75262***	0.000000	<u>E</u> <u>Mc</u> <u>S</u> <u>P</u> <u>M</u> <u>R</u> <u>T</u> <u>L</u>
Ear width	16.10546***	0.000000	<u>M</u> <u>P</u> <u>R</u> <u>E</u> <u>S</u> <u>Mc</u> <u>L</u> <u>T</u>
Head length	4.55743***	0.000060	<u>Mc</u> <u>E</u> <u>S</u> <u>R</u> <u>L</u> <u>T</u> <u>P</u> <u>M</u>
Snout length	9.90888***	0.000000	<u>Mc</u> <u>E</u> <u>P</u> <u>L</u> <u>S</u> <u>R</u> <u>M</u> <u>T</u>
Ear length	7.04806***	0.000000	<u>E</u> <u>Mc</u> <u>M</u> <u>P</u> <u>R</u> <u>S</u> <u>T</u> <u>L</u>
Height at wither's	3.24577**	0.002224	<u>E</u> <u>Mc</u> <u>M</u> <u>S</u> <u>L</u> <u>R</u> <u>P</u> <u>T</u>
Height at beginning of rump	1.29291 ^{ns}	0.251606	<u>E</u> <u>Mc</u> <u>M</u> <u>S</u> <u>L</u> <u>R</u> <u>P</u> <u>T</u>
Rump width	17.56048***	0.000000	<u>E</u> <u>S</u> <u>T</u> <u>P</u> <u>M</u> <u>R</u> <u>L</u> <u>Mc</u>
Rump distance	11.22352***	0.000000	<u>E</u> <u>M</u> <u>P</u> <u>S</u> <u>Mc</u> <u>R</u> <u>T</u> <u>L</u>
Height of the rump	1.99640 ^{ns}	0.053851	<u>E</u> <u>Mc</u> <u>S</u> <u>T</u> <u>P</u> <u>M</u> <u>L</u> <u>R</u>
Rump at beginning of tail	4.92961***	0.000021	<u>L</u> <u>P</u> <u>E</u> <u>M</u> <u>Mc</u> <u>R</u> <u>T</u> <u>S</u>
Ham length	19.79919***	0.000000	<u>E</u> <u>Mc</u> <u>M</u> <u>P</u> <u>R</u> <u>L</u> <u>T</u> <u>S</u>
Shoulder length	3.60566***	0.000839	<u>P</u> <u>M</u> <u>R</u> <u>L</u> <u>S</u> <u>T</u> <u>E</u> <u>Mc</u>
Snack perimeter	5.32491***	0.000007	<u>E</u> <u>M</u> <u>P</u> <u>S</u> <u>L</u> <u>R</u> <u>T</u> <u>Mc</u>

The Entrepelado variety occupies the top in the means of most of the variables forming separate groups among them.

In general terms the variability among varieties was high in most of the studied variables. We found important statistical differences in the variables: weight, width between eyes, width of snout, ear width, head length, snout length, ear length, height at wither's, rump width, rump distance, rump length, ham length, shoulder length and snack perimeter, while head width, height at beginning of rump and height at beginning of tail shown no differences.

The canonical discriminate analysis did not point out a clear multivariate definition with the exception of Manchado de Jabugo. However the Mahalanobis distances marked important differences among varieties, as shown in Table 2. The Mahalanobis method establishes their differences taking into account the levels of sample variations. In this way our results do not give a base for categorical conclusions. Out of the Iberian branch to generalize our conclusion we will have to enclose information from other close breeds (f.e., Canarian Black, Mallorcan Black, etc.). This is our purpose in a Spanish national project in development. We must point out the differentiation shown here by the Manchado, probably produced by its ancient status. In the other hand, the low differentiation of the Mamellado is surprising.

Table 2. Mahalanobis distances among Iberian varieties

	M	Mc	E	P	R	L	S	T
M	0.000	29.543***	2.5024 ^{ns}	6.240*	3.0669 ^{ns}	6.966***	6.178*	5.057**
Mc		0.000	23.39***	26.83***	23.45***	25.27***	24.63***	26.99***
E			0.000	9.853***	1.282***	3.325***	2.659**	3.262***
P				0.000	10.93***	15.81***	15.58***	14.48***
R					0.000	2.198***	3.154***	2.67***
L						0.000	4.636***	3.708***
S							0.000	1.622 ^{ns}
T								0.000

Figure 1 shows the populational structure of the cluster analysis. Here we can observe the Manchado is clearly defined of the other varieties, which are forming a close group.

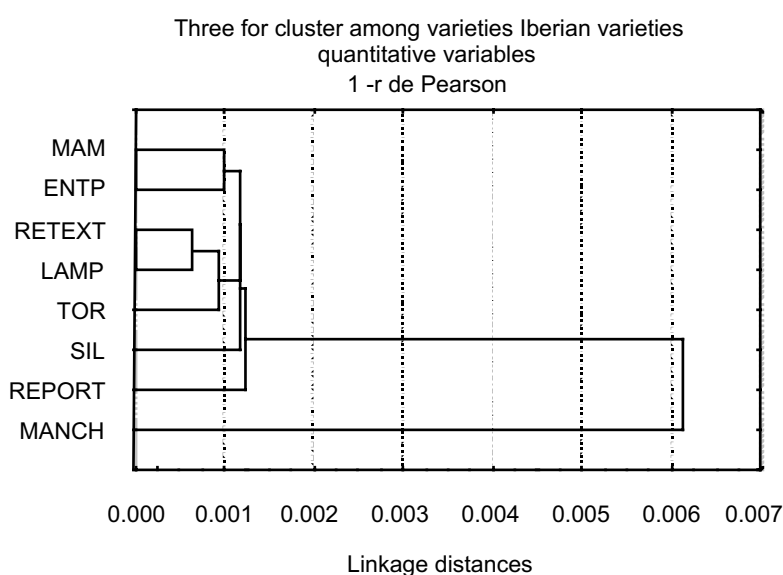


Fig. 1. Three for cluster among Iberian varieties.

Those show a common evaluative Iberian groups with the exception of the Manchado are clearly independent.

Taking into account the relationships established by the cluster analysis, the grouping shown by the discriminate analysis, and the individual behaviour for each variety shown by the analysis of variance. We conclude that the Iberian pig shows a clear racial identity with the exception of the Manchado of Jabugo, but statistical significant differences among varieties have been shown, that clarifies the internal differentiation of this breed, especially distinguished in the Entrepelado, Torbiscal and moreover Lampiño varieties.

In any case, it is necessary to evaluate there results together with other information productive and genetic with a view to definitively define the populational structure of the Iberian pig.

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