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Ethnozootechnical characterization and analysis of the genetic situation of the Chato Murciano pig breed

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SUMMARY - At present, 40 adult animals share the total population of the Chato Murciano pig breed. This is one of the most endangered native pig breeds of Spain. This paper, develops the morphological characterization of this breed studying thirteen quantitative variables and six qualitative variables from a sample of 24 male and female adult animals. It has also been carried out the evaluation of individuals and the population inbreeding levels of the breed.

Key words: Swine, conservation, genetic resources.

RESUME - *"Caractérisation ethnozootechnique et analyse de la situation génétique de la race porcine Chato Murciano". A présent, seulement 40 animaux adultes constituent la population totale de la race porcine Chato Murciana. Il s'agit par conséquent de la race autochtone espagnole la plus en danger. Dans ce travail on développe la caractérisation morphologique de la race par l'étude de treize variables quantitatives et six variables qualitatives dans un échantillon de vingt-quatre adultes, mâles et femelles. On a aussi réalisé l'évaluation des taux de consanguinité de la race aussi bien à niveau individuel que de population.*

Mots-clés : *Porc, conservation, ressources génétiques.*

Introduction

The pressure imposed by commercial hybrids obtained from select breeds and submitted to highly technical intensive systems has pushed the Chato Murciano breed aside to the extent of practically eliminating it (Lobera, 1997; Martínez, *et al.,* 1998). At the present time, the nucleus of pure breed specimens is very small, and at an advanced age: facts which have obliged the Ministry of Agriculture to declare the breed under special protection.

The Agricultural Investigation and Development Centre (CIDA) and the Agricultural Training and Experiments Centre (CCEA), of the Murcian Regional Government started working some years ago on the conservation of the scarce specimens of this breed and on raising the number of animals with the collaboration of a small number of stockbreeders.

As regards this first activity, semen from five male pigs of this breed was frozen semen which is also being used in artificial inseminations of female pigs, not only in CCEA, but also in private stock farms which request it, with the condition that they supply characteristic data of any animals obtained from this process. The rotation of male pigs is taken into account when mating them with pure-breed or hybrid females, in order to dilute the consanguinity to the greatest extent. The aim of this increase of census is to find the characteristics of this breed which most interest the evolutionary industry and which in the past provided the authentic products of the Region of Murcia.

The aims of this paper are: to define the zootechnical situation of this breed, defining its standard as it is today, and to show the genetic situation of the individuals and of the population in general, in order to undertake a recovery programme of the breed.

Material and methods

24 animals were used, divided into four groups: Group 1: Three seven-month-old male pigs destined to food and slaughtering; Group 2: Four seven-month-old female pigs intended for reproduction; Group 3: Twelve reproductive female pigs in different reproductive situations; Group 4: Five reproductive male pigs intended for the production of semen.

The variables measured for each of the animals were as follows: *Quantitative variables:* Head length; Head width; Length of the snout; Distance between eyes; Height of the Withers; Breast height; Breast width; Height of the Rump; Rump width; Length of the Rump; Longitudinal Diameter; Thoracic circumference and Shank circumference. *Qualitative Variables:* Coat and hair, special features, hooves, mucous membrane, ears, number of mammary glands.

To study the genetic situation of this breed, a investigation was carried out of the genealogical records of the complete population to be able to determine the degree of purity of all the specimens, as well as an analysis of the population structure to determine the sex and age ratios.

Apart from this, we calculated the individual coefficient of consanguinity (Wright, 1922) of all the animals using their genealogical information, as well as deducing the average level of inbreeding in the population, according to the average coefficient of the population consanguinity (Cavalli-Sforza and Bodmer, 1981).

Results and discussion

Zoometric study carried out on 24 animals of this breed and from which the following results for 13 parameters were obtained (Table 1 and 2).

Table 1. Average zoometric values found in three groups of pigs of the "Chato Murciano" breed

Variable	Group 1 n=3	Group 2 n=4	Group 3 n=12
	X ± S.D.	X ± S.D.	X ± S.D.
Head length	25.16 ± 0.28	24.5 ± 1.0	25.65 ± 1.95
Head width	13.0 ± 2.17	13.17 ± 1.26	16.32 ± 1.17
Length of the snout	8.16 ± 1.25	7.25 ± 0.5	8.5 ± 1.44
Distance between eyes	9.0 ± 0.25	8.62 ± 0.75	11.91 ± 1.83
Height of the withers	58.33 ± 4.16	56.76 ± 1.25	65.25 ± 3.01
Rump width	29.33 ± 1.75	25.87 ± 1.43	33.12 ± 2.47
Longitudinal diameter	94.83 ± 8.40	88.5 ± 5.30	97.75 ± 6.07
Breast height	31.16 ± 2.02	30.25 ± 0.95	37.87 ± 2.98
Breast width	28.50 ± 1.3	27.62 ± 3.47	31.93 ± 2.13
Height of the rump	64.33 ± 1.15	65.25 ± 2.21	71.12 ± 2.47
Rump length	27.16 ± 0.76	28.62 ± 3.19	28.33 ± 2.45
Thoracic circumference	105.66 ± 5.03	96.25 ± 2.98	112.87 ± 87
Shank circumference	16.66 ± 0.76	16 ± 0	18 ± 1.83

Group 1: Three seven-month-old male pigs intended for food and slaughtering; Group 2: Four seven-month-old female pigs intended for reproduction; Group 3: Twelve reproductive female pigs in different reproductive situations

Qualitative variables

Coat and hair: The breed has a black coat, characteristic of the so-called "Chato Murciano Negro" variety, which was produced in the CCEA in Lorca. The colour is uniform except for a

few specimens which have white patches on their legs, snout and tail. The appearance of white parts is due to the characteristics inherited from the male pig of the Berkshire breed at the time of the breed formation.

The hair is characteristic of the female pigs and is evenly distributed all over the body-the area of the mammary glands is free from hair in the female pigs.

Special features: When there is white colouring found in the above mentioned areas, it not only appears on the skin, but also in the hair and on the hooves. The mucous membrane of the mouth is normally dark in colour, with the above mentioned exceptions. It may have a whitish appearance with sections of white hair in the closest areas.

Ears: They are large, triangular and point upwards and outwards.

Number of mammary glands: In the present specimens, the number varies between twelve and fourteen.

Table 2. Zoometric values found in the male pigs of this breed

Variable	Chato viejo	Chato 222	Chato 215	Chato 802	Chato 807
Age	12 years	4.5 years	3.5 years	1.5 years	1 year
Head length	28.5	29	29	28.5	27
Head width	20	18.5	18	17.5	16
Length of the snout	9	10.5	10.5	10	9.5
Distance between eyes	16	14	16	13	12.5
Height of the withers	82.5	87	85	73	71
Rump width	37	37	36.5	39	34
Longitudinal diameter	132	124	124	118	107.5
Breast height	43	42.5	42.5	42	36
Breast width	44	37.5	37	37	34
Height of the rump	85.5	86	86	78	81
Rump length	42	36	38	34	31
Thoracic circumference	140	134	126	120	109
Shank circumference	22	22	22	19	18

Genetic situation of the breed

We have found some values of the individual coefficient rate of consanguinity ranging between 0 and 32.30%, and regarding the average coefficient of consanguinity, according to Cavalli-Sforza and Bodmer (1981), a value of 10.95% of the population, and this offered us a margin between 2.12 and 19.78%, within which the average consanguinity of the population is found (Table 3). This figure of consanguinity can be considered dangerous, as it maintains some relatively high levels which exceed the limits of the appearance of effects of inbreeding depression, according to Legates and Warnwick (1992). The most immediate consequences of the consanguinity depression are the loss of adaptive values (productive and reproductive) in this breed, as well as the appearance of the expression of deleterious genes in the population.

Moreover, we must be very cautions, as this figure only indicates the accumulated levels of inbreeding from the genetic information available to us, and as this is a case of a breed recovered from a small number of animals, it is very possible that the rate of consanguinity prior to the genealogical check was high. For this reason, higher rates of underlying inbreeding are to be suspected, which would explain the fertility problems, the reduced number of piglets per litter, the low viability of the piglets, and the lack of hardiness in hybrids (reduction of the body size) as consequences of the inbreeding depression.

Table 3. The average level of inbreeding of the population, according to Cavalli-Sforza and Bodmer (1981)

No. animals		Relative frequency	F	$P_i * _{Fi}$
26	(11)†	0.541	0.0000	0.000000
01	(01)†	0.021	0.1250	0.002625
08	(08)†	0.167	0.1568	0.026177
04	(2)†	0.083	0.2500	0.020750
06		0.125	0.3125	0.039062
03	(03)†	0.063	0.3320	0.020916
Total				0.109530

†Crossed animals in absorption process

Conclusions

For future measures we derived a strict genealogical and reproductive control, so that a guided mating system is made compulsory, using the corresponding tables of co-ancestry, with the aim of finding out first hand the increase of consanguinity in future litters, and thus to reduce its effect to the minimum. Furthermore, as a complementary measure, the Genetic Conservation Index (Alderson, 1992) can also be used, to make future specimens bearers of the greatest number of founder animals of the breed. With this measure, the variability in the breed is maintained to the maximum, with the increase in consanguinity is minimalized.

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