APPLICATION OF DISCRIMINANT ANALYSIS TO THE MORPHOSTRUCTURAL DIFFERENTIATION OF 7 EXTENSIVE GOAT BREEDS

Luque, M[1].; Rodero, E[1].; Peña , F[1].; García, A[1].; Sierra, I[2]. and Herrera, M[1].

[1]Department of Animal Production, University of Cordoba (UCO), Spain.
E-mail:manuel@lukatan.com
[2]Department of Animal Production, University of Zaragoza, Spain.

SUMMARY

We have studied 7 goat breeds used extensively for meat production in Spain. The application of discriminant analysis to 18 measures taken on the animals is an effective method in the morpho-structural differentiation, as much among the breeds the eco-types. The Mahalanobis test establishes significant differences among the 7 breeds studied.

INTRODUCTION

The goat breeds for meat production are raised on an open raised range system of marginal areas of Spain. Its raising is oriented to produce a "pascual" or "milk" kid that depend to other factors different to the producers.

The seven breeds of goat studied in this paper are considered endangered species and their numbers are frankly less and less. In some of these cases, they show a preoccupying rate of cross-breeding within them and with breeds of a milk nature. There is not enough information about their production characteristics as far as their system of raising goes. Nevertheless, their potential for meat production is an important factor to be kept in mind although not enough is known about this, either about the quality or the quantity of their meat. Furthermore, they represent a highly important zoo-genetic resource in their environment and make up a base of an important animal population in this region.

The present study has been realized under the Project INIA RZ01-010-C3.

MATERIAL AND METHODS

18 zoo-metric measurements were taken of these goats according to the methods propòsed by Herrera et al. (1996) from a total of 1.044 adult females of the following goat breeds, the Negra Serrana (266), the Azpi Gorri (84), Pirenaica (152), the Blanca Andaluza (268) and from the Blanca Celtiberica breeds (274) from flocks in the autonomous communities of Andalusia, Castilla-La Mancha, Murcia, Aragon and the Basque region. To get the measurements, a zoo-metric ruler, a thickness compass and a metric tape was used.

The measurements were the following: Head length (LCF), Skull length (LCR), Head width (AC, Shoulder width (AH), Fore-wither width(AGA), Wither length (LG), Cross harness (ALC), Hip height (ALP), Height of sub-sternal hollow (AHS), Length diameter (DL), Back-sternum diameter(DD), bi-rib diameter (DB), Thoractic perimeter

(PT),Front Fore-hoof perimeter(PCA) Knee perimeter (PR) and hinf leg Perimeter (PCP).

For morphological characterisation information supplied by 18 variables studied were used. The homogeneity of the samples was evaluated through the variance co-efficients which constituted by themselves a test for morpho-structural homogeneity for the animals studied and whose measurements were taken in a previous study. The matrix and its Pearson correlation coefficients among all the variables reports the degree of harmony (Herrera, 2002) shown in the sample studied.

An analysis was made of the main components which allowed a determination of the variables that most influence have in the discrimination of breeds and flocks studied of which effect has been analysed and it is represented by canonical and Mahalanobis procedures.

The statistical calculations were done with the program, Statistical for Windows 6.0.

RESULTS AND DISCUSSION:

Studies on goat morphological structures have two basic aims: One, for the racial characterization and two, for the establishment of criteria for selection to improve the breed for a specific purpose. In this study, the purpose was to attempt to get a well-formed and greater weight in kids and at the same time this would give a greater profitability.

In the first instance, for racial characterization, it can be seen in Table 1 that the open range Spanish meat animals have a height of 69.73 cm. for the Moncaina breed and 77.12 cm. for the Blanca Andaluza breed, generally with a big format and greatly in a somewhat squared shape compared with the height (ALC) and length (DL). Having a big head, (this represents a third of its length), these are thin animals as deducted by their width values within the AGA values and are very boney with high extremities perimeters (PCA) which is not favourable for meat-producing goats.

Nevertheless, each breed has a determined morpho-structure, an expression of its quantitative morpho-structure that responds to a particular environment to which it is adapted and for which its pastors have raised it.

In previous works (Herrera et al. 1996) there were shown the existence of differentiated models in Andalusian goat breeds for milk (intensive systems) and meat production (extensive systems), as well as breeds for milk production (Florida and Payoya goat breeds) that live in zones of low or elevated mountain ranges with pending levels (Rodero et al. 2003), which suggests that in goat breeds for meat production can be proved these results.

When applying the discriminate analysis, the Mahalanobis test informing that the distances between all breeds were statistically significant ($p< 0.001$), and the classification matrix of the 7 breeds (Table 2) indicates that the breeds with greater percentage of allegiance are the Pirenaica (P), Moncaina (m) and Blanca Celtiberica goat breeds(C), the error degree a little bit higher in the allegiances of the Negra Serrana, Retinta and Blanca Andaluza goat breeds and especially high in the Azpi Gorri goat breed, which is stated in Figure 1.

Table 1.- Main statistics of the morphological variables of seven breeds of open range meat-producing goats

	AZPI GORRI N= 84			CELTIBÉR. N= 398			BLANCA AND. N= 274		
	Mean	Std.D.	c.v. %	Mean	Std.D.	c.v. %	Mean	Std.D.	c.v. %
ALC	74,47	3,68	4,94	71,45	3,57	5,00	77,12	3,60	4,67
DL	78,40	4,18	5,33	75,45	3,94	5,22	81,57	4,11	5,04
DD	34,23	2,48	7,25	32,64	2,73	8,36	34,13	2,36	6,91
LCF	24,33	1,66	6,82	23,46	1,29	5,47	25,26	1,89	7,48
AC	12,71	0,80	6,29	12,25	0,64	5,22	12,81	0,78	6,09
AGA	16,13	1,41	8,74	13,79	2,18	15,81	14,86	1,74	11,71
LG	23,17	1,35	5,83	21,64	1,09	5,03	23,44	1,69	7,21
PT	85,44	6,64	7,77	85,44	4,82	5,64	95,60	8,16	8,54
PCA	9,37	1,15	12,27	8,76	0,60	6,85	9,69	0,72	7,43

	PIRENAICA N= 152			NEGRA N= 266			RETINTA N= 79			MONCAINA N= 111		
	Mean	Std.D.	c.v. %	Mean	Std.D.	c.v. %	Mean	Std.D.	c.v. %	Mean	Std.D.	c.v. %
ALC	73,33	3,00	4,09	76,25	3,60	4,72	72,28	3,49	4,83	69,73	3,04	4,36
DL	76,57	3,66	4,78	82,12	4,73	5,76	73,51	6,72	9,14	69,64	4,21	6,05
DD	35,45	1,82	5,13	34,46	2,53	7,34	31,97	2,86	8,95	30,93	2,44	7,89
LCF	21,81	1,15	5,27	24,93	1,69	6,78	24,37	1,77	7,26	20,04	1,29	6,44
AC	13,43	0,73	5,43	12,74	0,86	6,75	13,54	1,66	12,26	12,09	0,66	5,46
AGA	16,57	1,10	6,64	14,36	1,87	13,02	11,84	2,02	17,06	14,99	1,04	6,94
LG	23,11	1,02	4,41	22,86	1,58	6,91	24,37	2,25	9,23	16,30	0,95	5,83
PT	91,42	4,62	5,05	96,94	5,27	5,44	89,03	10,48	11,77	82,12	5,26	6,41
PCA	9,46	0,59	6,24	10,15	0,88	8,67	9,81	0,61	6,22	8,22	0,48	5,84

Table 2.- Clasification Mattrix of the 7 breeds.

Breed	Percent	A	B	C	M	N	P	R
Azpi Gorri (a)	22,61905	19	14	42	0	4	5	0
Blanca Andaluza (B)	60,58394	5	166	35	2	53	7	6
Blanca Celtibérica (C	92,96482	3	14	370	0	8	2	1
Moncaina (M)	98,19820	0	0	2	109	0	0	0
Negra Serrana (N)	56,01504	0	81	26	3	149	6	1
Pirenaica (P)	92,10526	0	1	9	0	2	140	0
Retinta (R	73,75000	0	4	10	0	5	2	59
Total	74,13919	27	280	494	114	221	162	67

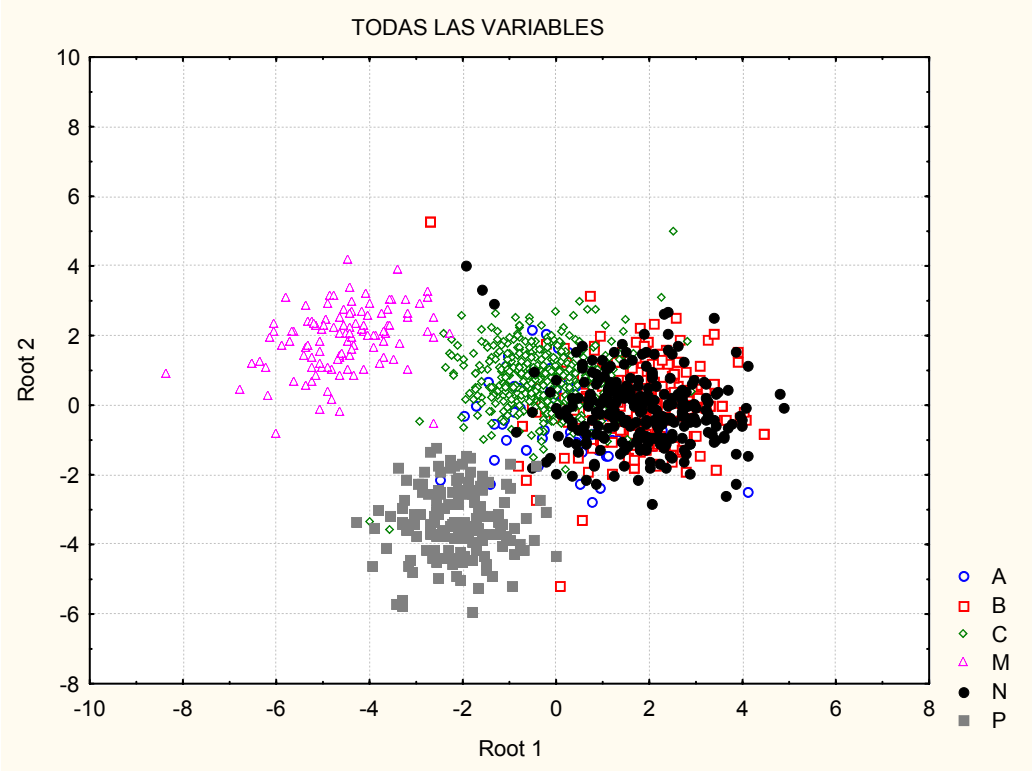
The interpretation of this graph from geographic location parameters of the different breeds seems to indicate that there exists adapted morpho-structural models to the different type of terrain, or pasturing area. In the case of the Pirenaica breed (P), the pasturing zone can be catalogued as of upper middle mountain (Pyrenean Mountains), with gentle slopes and valleys, whereas in the case of the Moncaina breed live in

mountain of medium altitude but pending (Moncayo Mountain), which possibly determines the clear differences in the location of the models the plot Figure 1.

The pasturing area for Blanca Celtiberica breed (C) has mountain ranges with elevated steep (Flowing North of Segura's Mountains), an deeper than that occupied by the Negra Serrana (N)and Blanca Andaluza breeds (B) who coexists, partly, in the South slope of the Segura's Mountains. However in Figure 1 it is observed that the morpho-structural model of the Blanca Celtiberica breed is differentiated from the other two breeds, the Blanca Andaluza and Negra Serrana breeds, that are not differentiated as clearly as in the analysis.

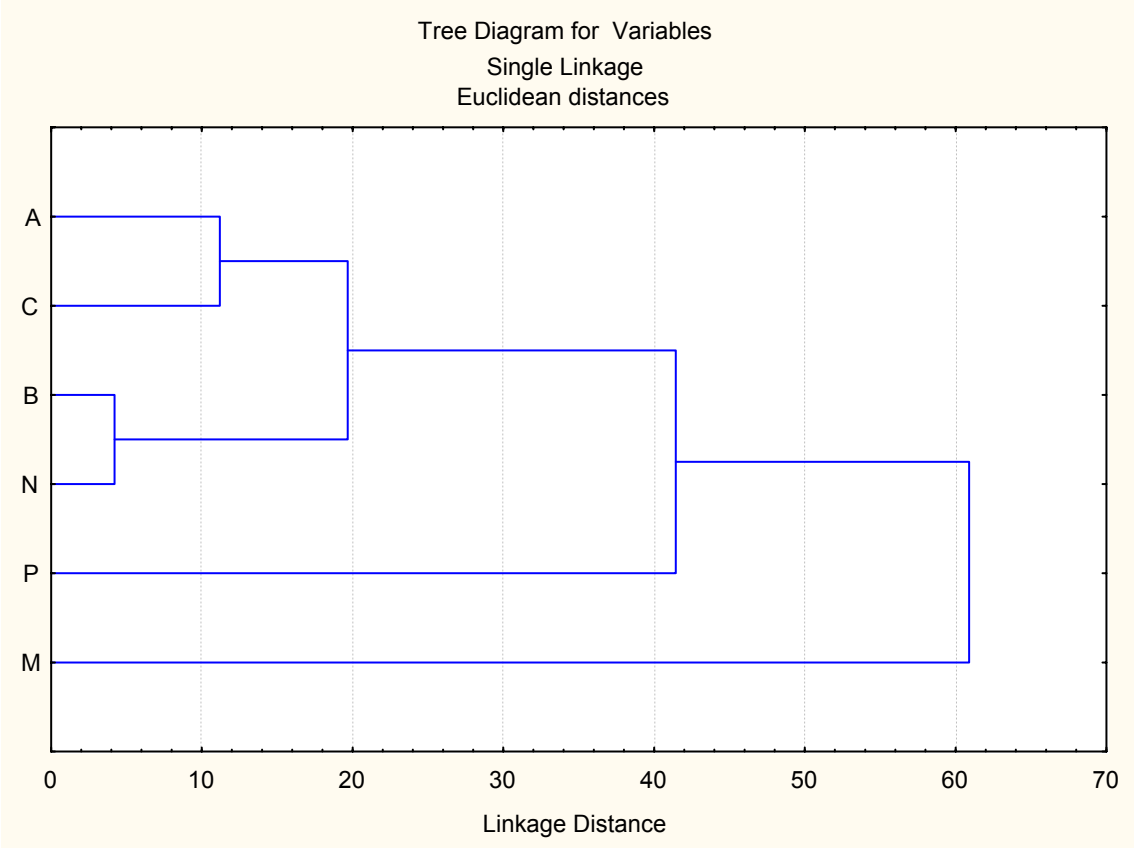
The case of the Azpi Gorri, with the lowest values in classification (Table 2) and a grouping less defined in the plot, could be interpreted as an answer to a morpho-structural model formed for the pasturing in abrupt areas and valleys between the Pyrenean model and locations studied for other breeds.

Figure 1.- Canonical representation of the seven breeds



The Euclidian distances are demonstrated in Figure 2, proving the theory showed before.

Figure 2.- Phenogram showing the relationship among the goat breeds.



CONCLUSIONS:

The discriminate analysis is a good tool to establish a differentiation among the morpho-structural models in goat breeds of extensive production, as occurs in other Spanish breeds for milk and mix production.

The existence of these models suggests a correlation between the morphological structure and the altitude degree and slope of the pasturing areas, a line or a way of investigation that is developing at this moment.

BIBLIOGRAPHY:

ALIA ROBLEDO, M. J. 1987. Estudio Etnológico y Productivo de la Agrupación Caprina "Negra Serrana". Madrid. Pag. 1 – 239.

BOUCHEL, D.; LAUVERGNE, E.; GUIBERT, E.; ET MINVIELLE, F. (1997). Étude morpho-biométrique de la chévre du Rove. I. Hauteur au garrot (HG), profondeur du thorax (PT), vide sous-sternal (VSS) et indice de gracilité sous-sternale (IGs) chez les femelles. Revue Méd. Vét. 148, 1, 37-46.

HERNÁNDEZ CEPEDA, J. S. 2000. Caracterización Etnológica de las Cabras Criollas del Sur de Puebla (México). Pag. 1 -321.