An extract from a study of the main characteristics and composition of the carcass of the Alentejo pig breed (Sus ibericus)

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An extract from a study of the main characteristics and composition of the carcass of the Alentejo pig breed (*Sus ibericus)**

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SUMMARY – The purpose of this study is the classification of different primal cuts from the Alentejo pig breed carcass and the evaluation of the effect that feeding and sex can have over them. The basic experimental design is the following: 3 (three) pig groups fed on different feeding regimes: commercial feed (Group 1, n=24); supplemented pasture (*montanheira*) with maize (Group 2, n=24); and supplemented pasture (*montanheira*) with triticale (Group 3, n=12). After the hemi-carcass (n=60) was jointed, carcass tissue composition was clearly influenced by the group factor (P<0.001), so animals from the supplemented pasture group show a greater proportion of bone and fat than the ones fed on commercial feed, which, in turn, show more muscle (P<0.01). The relations between these tissues are also logically influenced. On the whole, there is an energetic restriction (group with commercial feed) during the fattening period that as a consequence results in carcasses with less weight, more muscle and less fatness than carcasses obtained from pigs fed on supplemented pasture (*montanheira*).

Keywords: Alentejo pig breed, carcass, primal cuts, and tissue composition.

RESUME – *"Extrait d'une étude des principales caractéristiques et de la composition de la carcasse de la race porcine Alentejano* (Sus ibericus)*". L'objectif de ce travail est de classifier les différentes pièces de boucherie de la carcasse du porc Alentejano et d'évaluer les effets que l'alimentation et le sexe peuvent avoir sur celles-ci. Le dispositif expérimental de base est le suivant avec 3 (trois) lots de porcs aux habitudes alimentaires distinctes: nourriture commerciale (Lot 1, n=24); pâturage* (montanheira) *avec supplément de maïs (Lot 2, n=24); et pâturage* (montanheira) *avec supplément de triticale (Lot 3, n=12). Après la découpe de la demi-carcasse (n=60), la composition tissulaire de cette dernière a été clairement influencée par le facteur lot (P<0,001). Les animaux nourris au pâturage avec supplément présentent une plus grande quantité d'os et de graisse que ceux alimentés avec une nourriture commerciale, qui, eux, présentent plus de muscle (P<0,001). Les relations entre ces tissus se trouvent, elles aussi, influencées logiquement. En résumé, on vérifie donc une restriction énergétique (lot avec nourriture commerciale) pendant la période d'engraissement, ce qui a pour conséquence des carcasses moins lourdes, plus musclées et moins grasses que celles provenant de l'alimentation au pâturage* (montanheira) *avec supplément.*

Mots-clés : *Porc Alentejano, carcasse, pièces de boucherie et composition tissulaire.*

Introduction

We want to begin the Introduction of the theme of this study, to show firstly this slide which is a tile panel with a painting that symbolizes a close connection that existed in the past between the Alentejo art, science and extensive pig breeding, which generically represents the pig breeding system in traditional pasturing (*montanheira* – Fig. 1), characteristic of the holms oak and cork tree swine pastures, in which the Alentejo pig breed is an integral element of the Mediterranean ecosystem. It is noteworthy the great economical, financial and social importance that this type of breeding had in the rural world of Alentejo during the first half of the twentieth century. Therefore, the local pig breed of Alentejo is one of the ancestral founding varieties of the Iberian pig breed. Both are native breeds of the so-called Iberian Branch.

In the following slide, we start by introducing the herd of swine's Alentejo pig breed in *montanheira* of the region *Baixo Alentejo – Ourique (1997-98).*

Fig. 1. Herd of swines – Alentejo pig breed in "montanheira".

In terms the standard of the autochthonous Alentejo pig breed being studied, we present the following summary of the mentioned standard, according to the Agriculture Ministry, through the Decree number 17133 published in the *Diário da República* Journal, dated from 1959-04-22, emphasizing the following:

(i) General features – medium sized animals, with easy mobility and of great rusticity.

(ii) Skin – with rare bristles, thin and black, red and blonde in color.

(iii) Head – long, thin, small, thin and triangular ears with the edges pointed outwards.

(iv) Neck – medium sized and brawny.

(v) Body – plump thorax, lowered belly with ten udders, lowered thigh, tail with medium insertion ending with a bristle tuft.

(vi) Limbs – of medium length and well groomed, ending with small feet with hard nail.

(vii) Most frequent defects – very long head, badly connected neck, less deep thorax, arched dorsum-lumbar region, lowered hindquarters, very long limbs and thick and abundant bristles.

Objectives

We present now the objectives of our work that aim to study the influence of the type of feed (conditioned by the system of exploration) and the sex, during the final fattening period over:

(i) The characteristics of the carcass;

(ii) The characteristics of the butcher cut;

(iii) The tissue composition of the butcher cuts.

Materials and methods

According to the general experiment drawing we used a total of 60 animals (30 males that were castrated between 75 and 150 days of life and 30 females) with live weights between 83-86 kg (in the beginning of the tests) and 136-151 kg (at the end of the tests), divided into 3 groups with distinct feeds and exploration systems (intensive system – Group 1, and extensive system in swine pasture supplemented with cereals – Groups 2 and 3). During the finishing phase (duration period of the test) we collected on a regular basis samples of all the types of feed consumed by the animals and later analyzed these in the lab with the objective of associating the chemical composition of the feed with the studies of the carcasses and also with the profile of the acids of the subcutaneous and perirrenal fat (Oliveira, 2000; Oliveira *et al*., 2004).

Concerning the objectives aforementioned at the end of the tests of the fattening period, we proceeded to slaughter the animals in the industrial slaughterhouse of *Beja* with the objective to study the carcasses, which followed the general experimental drawing using 60 carcasses and from each we collected the half carcasses (left and right) and proceeded to cut and trim of the butcher cuts of each half carcass left without head.

Besides the collection of samples of subcutaneous fat in the shoulder region (cross) for later analysis of the profile of the fat acids, we also collected data of the whole carcass and percentage of exsiccation (%E) through the following equation: %E=(PCQ, kg – PCF, kg)/PCQ, kg x 100 and the slaughter yield (RA) also through the following equation: RA=(PCQ, kg / live weight of the animal to slaughter, kg) x 100.

Over each cold half carcass in study we proceeded to measure the size of the loin (computational program of planimetry VIDS IV). In order to determine this parameter we proceeded as follows: transferred the image in acetate over the left half carcass in the anatomical point located between the 13th and 14th intercostal spaces, after transversal cut over the muscle *Longissimus dorsi* (as per the methodology described by Dobao *et al.* (1987)) and followed by measuring of the loin area with the aid of the aforementioned computational program.

Also we executed the cut and trim of the butcher cuts of a half carcass (Fig. 2) that we present according to the Portuguese Norm – NP 2931 of 1985.

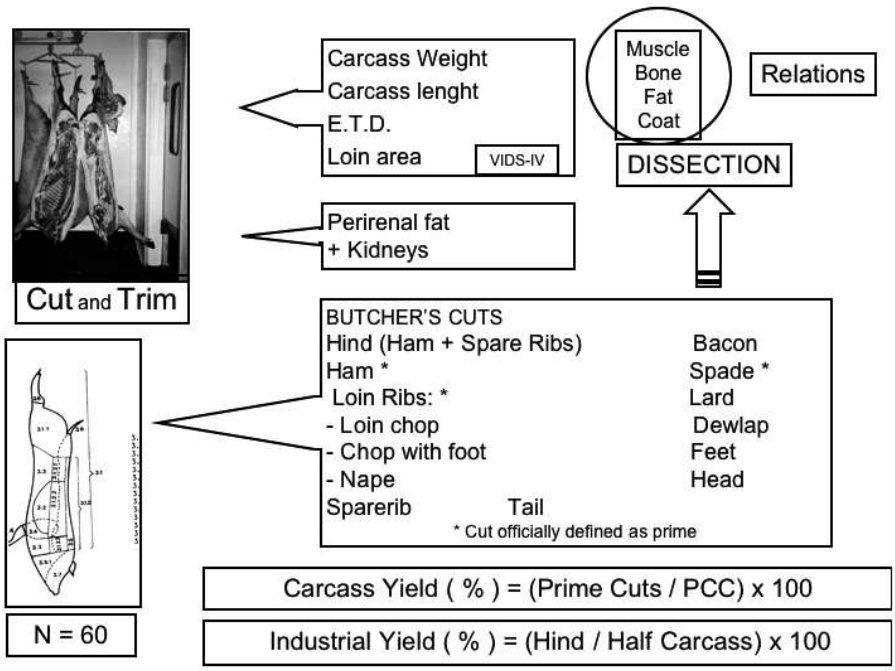

Fig. 2. Butcher cuts of a half carcass according to the Portuguese Norm – NP 2931 (1985).

*: Cut officially defined as prime.

Finally we determined the thickness of the dorsal lard (ETD) measuring with the aid of a tape measure, ETD_1 (scapular) – at the level of the first dorsal vertebrae, ETD_2 (back) – at the level of the last rib and at 2, 4 and 6 cm of the medium line and ETD_3 (lumbar) – at the level of the last loin vertebrae and the carcass yield (RC) and industrial yield (RI) using the following equations:

RC=weight of the prime cuts, kg / total weight of the hot carcass, kg x 100

RI=(weight of hind, kg + ham weight, kg) / carcass weight, kg x 100

The data collected were subjected to the statistical analysis according to the mathematical model described below in which we highlight the application of the co-variable weight of half of a cold carcass (W_i) in the model, taking into account that the size of the animal could influence the interpretation of the results. Therefore we used the program *Statgrafics v. 5.0* both for the descriptive statistics as for a variance analysis (ANOVA multifactorial model) and later the application of the Tukey test when there were significant differences for the factor group in study.

$$X_{ijk} = \mu + W_i + L_j + S_k + (L_j \times S_k) + \varepsilon, \text{ in which:}$$

X_{ijk}: Value of the individual i belonging to the group j and of gender k.

μ: General average.

W_i: Co-variable, average weight of half cold carcass.

L_j: Additive effect due to the group.

S_k: Additive effect due to the gender.

$L_j \times S_k$: Interaction between the group and gender factors.

ε: Error of the model.

Results and discussion

Now we present and discuss the results collected, observing, in relation to the characteristic of the carcass, PCQ, PCF and% of the dry loss, we find significant differences in which we show the superiority of the Group 3 in relation to the rest in terms to the average weights of the cold and hot carcasses (Fig. 3).

In terms of the carcass yield (Fig. 4) the effect of the co-variable is evident and only on the industrial yield we find significant differences between the groups being studied with the Group 1 the one that shows a higher percentage. It should be noted the low industrial capabilities of the carcass of the Alentejo pig breed.

As it would be expected, we verify that there are significant differences between the groups in terms of the carcass length and the weight of half cold carcass, in ETD and in the loin area (Figs 5 and 6) in which this last parameter, that has such an economic importance, shows that Groups 1 and 3 present larger areas maybe due to the application of the general improvement plan in the exploration of the Group 3 or maybe due to the efficacy of the planimetry methodology applied (Manual VIDS IV, 1988), that was object of our research work in the course of the development of the plan of this doctoral program.

In relation to the prime cuts (ham, spade and loin ribs) of half of a cold carcass (Fig. 7) it shows that there were no significant differences in relation to the weights of the mentioned cuts. To note the marked effect of the co-variable (weight of half of a cold carcass) over the mentioned prime cuts.

In terms of the tissue composition of the prime cuts and of the half cold carcass, we verify that in the ham, only the bone and the coat manifest significant differences, also in the spade, and in the loin ribs of the muscle and the fat show considerable differences.

In terms of the tissue ratio of the prime cuts, relation muscle/fat and relation muscle/bone, it is verified that the relation muscle/bone manifest significant differences in the ham and the spade while in the loin ribs it is in the relation muscle/fat.

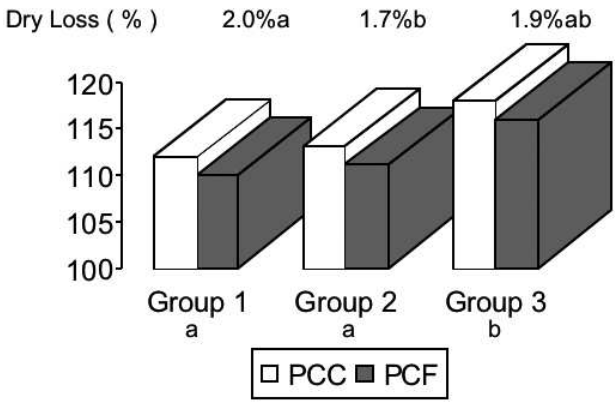

Fig. 3. Weights (kg) of carcasses (PCC; PCF) and dry loss (%).

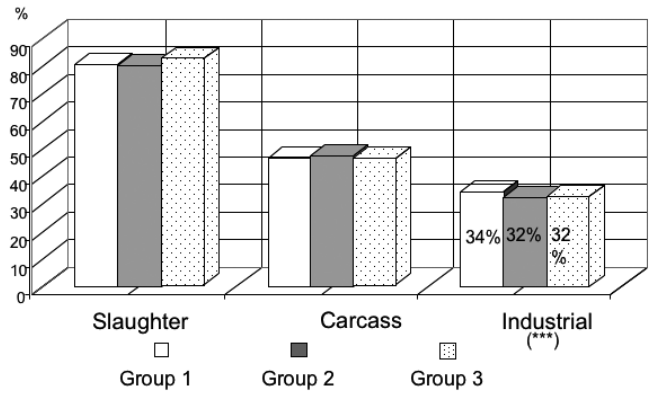

Fig. 4. Differents yields.

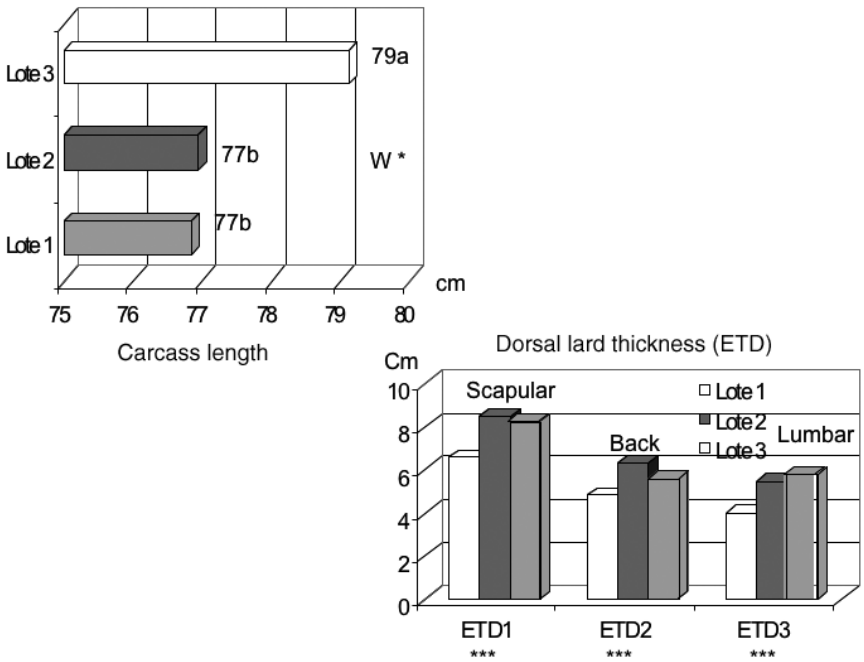

Fig. 5. Carcass length and dorsal lard thickness.

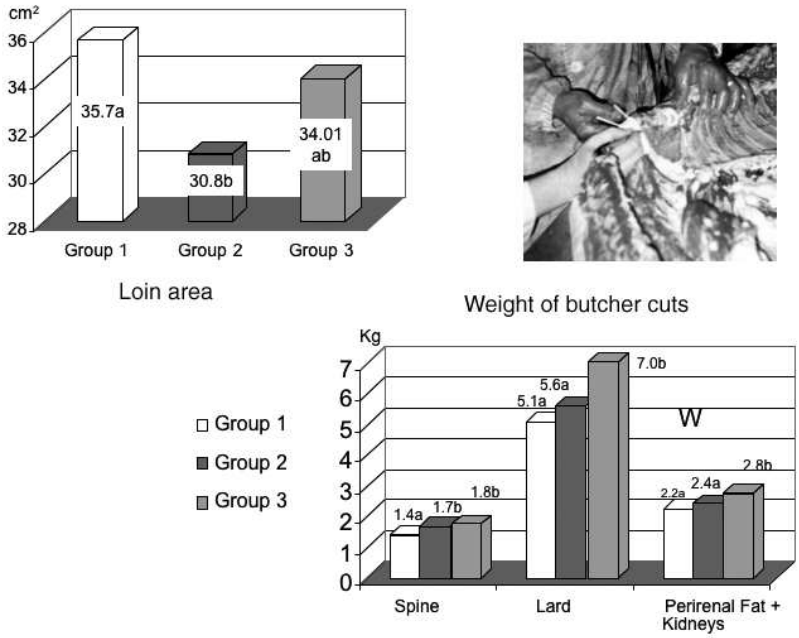

Fig. 6. Loin area and weight of butcher cuts.

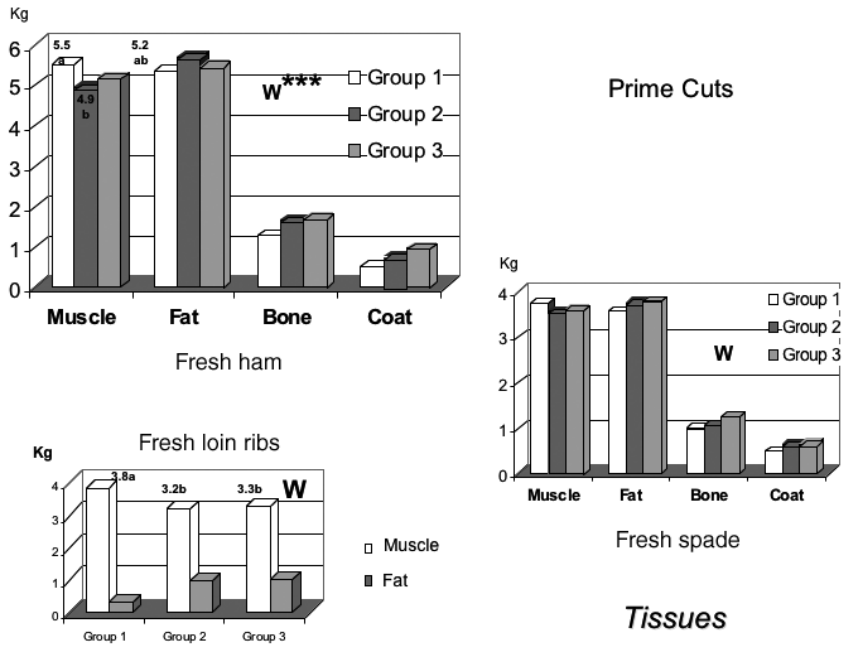

Fig. 7. Prime cuts (ham, spade and loin ribs).

In relation to the whole of the fat cuts and the bone cuts it is worth highlighting that the pig of Alentejo just like the Iberian pig, manifests a strong adiposeness tendency referenced by the authors quoted, taking into account that the fat is an important factor for both breeds. In terms of the bone parts, in the case of the Alentejo pig breed, only the backbone shows significant differences in our trials.

In the study that we performed over the butcher's cuts we verify that the results referring to the Iberian pig and particularly of the prime cuts, are similar to those of the Alentejo pig breed, (Fig. 8), in general terms in their fundamental aspects, namely the results obtained by De Pedro (1987) and more recently by Mayoral (1994), Benito *et al.* (1998) and Mayoral *et al.* (1999).

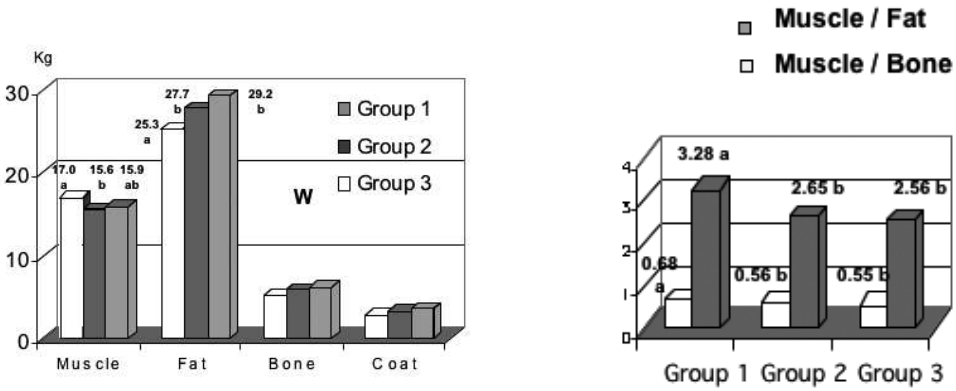

Fig. 8. Tissue components and relation in half carcass.

In the half of the cold carcass, the weight of the tissue components manifest significant differences, which are due to the feeding effect, which is not verified in the prime cuts that we have just refereed. Knowing that the valorization of these autochthonous breed it‘s in the prime cuts, it would be good to rethink the feeding factor, although it is known that this type of pig is the best user of the local feeding resources of the swine pasture ("montanheira") with the objective of obtaining fresh and transformed products of a high quality.

In terms of sex effect, in fresh loin ribs (Fig. 9), we observe that females show heavier weight, and percentage of the prime cut fresh spade ribs, which is one of the parts with economic importance, both to be consumed fresh and after being transformed, if we take into account that in this cut it is included the loin. To be highlighted that the authors De Pedro (1987) and Mayoral (1994) observe similar situations, referring to the prime cut of the loin in the Iberian pig.

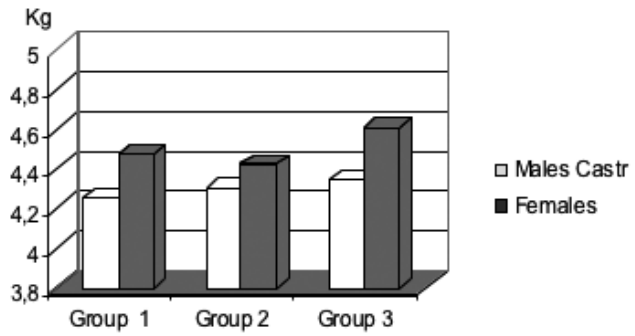

Fig. 9. Fresh loin ribs yield. Sex effect.

Conclusion

As a final conclusion and according to the results found it can be pointed out the following: The tissue composition of the carcass was clearly influenced by the factor of the feeding, for that the animals from the supplemented swine pastures ("montanheira") present a higher quantity of bone and fat that those fed with commercial feed, which present a higher quantity of muscle. The relations between these tissues are also logically influenced.

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