# EFFECT OF SLAUGHTER WEIGHT ON CARCASS QUALITY TRAITS OF ALENTEJANO PIG BREED.

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## Background

"Alentejano" pig breed is an autochthonous Mediterranean breed traditionally reared under extensive conditions. This pig inhabit populate the southeast region of Portugal (Alentejo) integrating the agrosylvopastoral ecosystem named "montado". In the montado there is a prodominance of oak-dominated forest and grassland. Traditional swine prodution system was characterized by a long growing period with nutritional insufficient requirement supply, which could limiting the potential growth, and a fattening period during the Autumn under oak forest grazing acorns and grass ("montanheira") an highly energetic diet. At the end of its production cycle pigs were slaughtered with 18 - 24 months aged and weights between 120 and 160 kg LW. The fattening period in "montanheira" originated carcasses too fat with low meat percentage (ALMEIDA et al., 1993; NUNES, 1993). This kind of carcass is considered the best for manufactured dry cured products and was during decades the main source of fresh meat in the diet of the people living in this region.

Considering the volume and the increase of fresh pig meat consumption in Portugal the farmers forward increase their production for this market, almost dominated by the meat from precocious pig breeds reared in the intensive production system. Based on high organolpetic quality, pork from Alentejano's hogs could an effective alternative for meat. However, carcass has too many fat and a bad proportion of lean cuts which difficult the economic rentability for production system.

## Objectives

The aim of this work was to investigate what will be the best slaughter weight for hog's in order to improve the percentage of lean meat as well as, to find physical measures of loin muscle and back fat that allowed us to predicted the proportion of the lean cuts.

## Methods

30 Alentejano pigs, born January were castrated when they were 60 days old. After weaning piglets were transferred to individual pens at open air but protected from rain and fed a commercial diet (15% CP; 3100 kcal DE) offered 85 % of *ad libitum*. At the beginning of the experiment 5 animals with 40 kg live weight (LW) were slaughtered. Remaned animals were weighted weekly and slaughtered (5 animals) at 70, 80, 90, 100 and 110 kg LW. After 24 h fasting the animals were weighted and then slaughtered. Carcass weight (without kidney stew) was recorded 30 min post mortem (hot weight) and 24 h after chill (cold weight). The lost weight during chill was calculated. At this time the left side of each carcass was submitted to commercial cuts according to the PORTUGUESE NORM (N – 2931). The yield of lean, fat and bone cuts was determined considering half carcass weight. The lean cuts include loin, the psoas muscles, the nape of the neck, leg and shoulder without subcutaneous fat and skin. The fat cuts include the backfat, belly and subcutaneous fat and skin of the leg and shoulder. The bone cut includes mid ribs and head. The back fat (include the derme) and loin muscle depth was measured 6 cm lateral to the mid-line of the carcass. The measure of loin muscle depth are the average of the first measure and two others 0,5 cm from it in both directions. Was also measured the loin muscle area and width. Those measures were taken at three anatomical sites (between the 3 $^{th}$ and 4$^{th}$ lumbar vertebrae, the last rib and between the 3 $^{th}$ and 4$^{th}$ last ribs). An ANOVA was carried out and the means comparison was made by SNK test. The correlation between the variables studied was determined by the Pearson coefficient. SPSS statistical program was used.

## Results and Discussions

Estimated carcass traits are presented in table 1. With the increase of slaughter weight (SW) an increase of worm and cold carcass weight was observed, as expected. After the SW 70 kg LW, intervals of 10 kg LW originated an average increase of 7,56 ± 0,98 in cold carcass weigh. The percentages of weigh lost during chill ranged within 7,24% and 2,17% showing a clear trend to decrease with the increase of the SW, although significantly different for 40 kg LW group. This fact can be explained by the effect of the increase of amount of fat in carcass, discussed below, that prevent the excessive carcass dehydration. The carcass yield also showed a trend to increase with the SW but contrarily the expectations only the lighter group presented a significant different yield. Was expected more expressive increment in carcass yield. Concerning to the cut traits was observed a trend for the increase of the percentage of fat cuts and a decrease of lean and bone cuts proportions. Once again only the lighter group showed significant differences. The greatest increment in fat cuts between 40 and 70 kg LW was not totally unexpected since it is widely know the genetic potential for precocious fat deposition in Alentejano pig carcass (DE PEDRO, 1987; FREITAS, 1998; NEVES et al., 2000). Between 70 and 110 kg LW only a slight increase was observed. The evolution of the proportion of lean cuts registered an inverse pattern, as expected. Between the first two slaughters weights decreased rapidly and than maintain a regular trend to decrease. The same was observed in the percentage of bone cuts.

The slaughter weight registered a positive correlation with the percentage of fat cuts (0,75; $P<0,05$) and negative one with the percentage of lean cuts (- 0,67; $P<0,05$).

Results of muscle loin (area, depth and width) and back fat thickness at tree different anatomic sites, are presented in table 2. In the evaluation points, the increase of slautgher weights increased the loin muscle area and the back fat thickness, but the loin muscle depth, contrary what expected, was not quantitatively affected. Only at the last rib was observed a trend for an increment of the loin muscle width, but not significantly. At all the three sites an increment of the loin muscle width was observed. At the vertebrae lumbar region was observed the greater increment of muscle loin width from 40 to 110 LW, 3 cm vs. 1,1 and 1 cm in the last rib and 3th and 4th last ribs, respectively. Globally these results suggest that the increment of loin muscle area was preferentially due to the development of muscle in the width direction than in depth, mainly in the hind carcass region (specially in lumbar region). This idea is supported by the high correlation coeficient found between the slaughter weithg and loin muscle width (0,73 and 0,54 at lumbar vertebrae and last rib, respectively). In respect to the evolution of back fat thickness the larger increment was observed in dorsal vertebrae region, especially between the 3th and 4th last ribs (4,6 cm). At the last rib the increment was 4,3 cm and in the vertebrae lumbar region 3,7 cm. These results are quite similar to those found by FREITAS (1998) and NEVES et al., (2000).

The results from the correlation matrix shown none correlation between the percentage of lean cuts and muscle loin depth, as expect from ANOVA results. On the other hand, a high correlation and highly significant was found between the percentage of lean cuts and the back fat

depth, in all anatomical sites. The correlation coefficient found was - 0,79, - 0,77 and - 0,72 for the measures at the 3 th and 4th lumbar vertebrae; the last rib and the 3 th and 4th last ribs, respectively. The very low correlation found for measures of the loin muscle could be explained, in part, by the difficulty to taken measures in standard conditions due: 1) irregularity of muscle limits, 2) variability in anatomical presentation and 3) deviation of the measure angle. Contrarily, the back fat had a quite regular anatomical presentation make more reliable the measure procedures.

The estimation formula for percentage of lean cuts using as independ variables the back fat depths was obtained by the analyses of regression linear model: % of lean cuts = 44,831 - 0,817 (back fat depth at 3 th and 4th lumbar bertebrae) - 0,581 (back depth at last rib) for a R = 0,72; R2 = 0,52; (P< 0,001). We need now to confirm this model with a further data.

## Conclusions

- Carcasses from pigs slaughtered between 100 a 110 LW lost less weight during chill (About 3%).
- A slaughter weight around 80 kg LW seems to be the more adequate for fresh meat production.
- In the interval of live weights studied, the loin muscle development seems to be regular and made preferentially in width direction than in depth, especially in the lumbar region.
- The back fat measures seems to be more indicate for estimation of cut lean proportion than the loin muscle measures, and the measures at the 3 th and 4th lumbar vertebrae and last ribs sites are recommended.

## References

DE PEDRO, E.J.(1987). Estudio dos factores sexo e peso del sacrificio sobre las caracteristicas de la canal del cerdo ibérico. Tesis Doctoral, ETSIAM. Universidade de Córdoba.

ALMEIDA, J.A.; J.A. NEVES; E. SABIO; A.B. FREITAS; J. PIRES da COSTA (1993). The effect of age and slaughter weight on characteristics and lipid composition of adipose and muscle tissues of "Alentejano" pigs finished in "Montado". In: *Proceedings of VII Conference on Animal Production*, Edmonton, Alberta, Canada, 328

NUNES, J.L.T. (1993). Contributo para a reintegração do porco Alentejano no Montado. Tese de Doutoramento. Universidade de Évora.

FREITAS, A B. (1998).Influência do nível e regime alimentar em pré-acabamento sobre o crescimento e desenvolvimento do porco Alentejano e suas repercussões sobre o acabamento em montanheira e com alimento comercial. . Tese de Doutoramento. Universidade de Évora.

NEVES, J. A; BENTO, P.; FARINHA, N. e FREITAS, A. Influência da dieta de engorda e do peso de abate sobre as características da carcaça do porco Alentejano. Resultados preliminares. X Congresso de Zootecnia, 2 a 4 de Novembro de 2000.

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Table 1. Comparison of carcass weights and yields, and fat, lean and bone cuts of Alentejano pigs at a various live weights.

| Slaughter weight groups | 40 | 70 | 80 | 90 | 100 | 110 |
|---|---|---|---|---|---|---|
| Average L W (kg) | 42,15 ± 0,89[a] | 70,92 ± 0,50[b] | 80,16 ± 0,54[c] | 89,61 ± 1,03[d] | 100,51 ± 1,00[e] | 110,00 ± 1,98[f] |
| Hot carcass weight (kg) | 31,52 ± 0,32[a] | 54,71 ± 0,52[b] | 62,08 ± 0,47[c] | 69,00 ± 2,24[d] | 77,27 ± 1,75[e] | 85,05 ± 1,96[f] |
| Cold carcass weight (kg) | 29,24 ± 0,32[a] | 52,23 ± 0,79[b] | 59,85 ± 1,17[c] | 66,66 ± 1,87[d] | 75,59 ± 2,18[e] | 82,48 ± 3,06[f] |
| Chill lost weight (%) | 7,24 ± 0,13[a] | 4,55 ± 0,65[b] | 3,59 ± 2,37[b] | 3,38 ± 0,98[b] | 2,17 ± 2,05[b] | 3,04 ± 2,21[b] |
| Cold carcass yield (%) | 69,39 ± 1,28[a] | 73,62 ± 1,10[b] | 74,67 ± 1,71[b] | 74,38 ± 1,66[b] | 75,18 ± 1,82[b] | 75,02 ± 1,98[b] |
| Percentage of fat cuts | 38,52 ± 1,61[a] | 47,10 ± 2,05[b] | 47,11 ± 2,43[b] | 48,89 ± 1,35[b] | 49,70 ± 1,46[b] | 49,56 ± 2,88[b] |
| Percentage of lean cuts | 44,73 ± 1,03[a] | 39,97 ± 1,20[b] | 39,17 ± 2,13[b] | 37,57± 1,01[b] | 37,53 ± 1,51[b] | 37,84 ± 2,25[b] |
| Percentage of bone cuts | 16,75 ± 0,67[a] | 12,93 ± 1,16[b] | 13,72 ± 0,69[b] | 13,55 ± 0,98[b] | 12,77 ± 0,94[b] | 12,60 ± 1,19[b] |

Means within the same line with same letter were not significantly different (P>0,05)

Table 2. Area, linear measures of depth and width of loin muscle and back fat depth, measured at three anatomical sites.

| Slaughter weight groups | 40 | 70 | 80 | 90 | 100 | 110 |
|---|---|---|---|---|---|---|
| Loin muscle area[1] ($cm^2$) | 14,8 ± 1,5[a] | 18,7±1,89[b] | 19,8 ± 2,1[b] | 21,1 ± 2,5[b] | 22,0 ± 2,2[b] | 21,9 ± 3,1[b] |
| Loin muscle depth[1] (cm) | 3,1 ± 0,25 | **3,3** ± 0,72 | 3,0 ± 0,18 | 3,0 ± 0,36 | 3,0 ± 0,22 | 3,0 ± 0,22 |
| Loin muscle width[1] (cm) | 6,7 ± 0,84[a] | 8,1 ± 0,44[ab] | 8,8 ± 0,57[ab] | 8,7 ± 0,96[ab] | 9,1 ± 0,76[ab] | 9,7 ± 0,78[b] |
| Backfat depth[1] (cm) | 1,8 ± 0,47[a] | 3,6 ± 0,79[b] | 4,6 ± 0,66[c] | 4,7 ± 0,58[c] | 5,4 ± 0,72[c] | 5,5 ± 0,57[c] |
| Loin muscle area[2] ($cm^2$) | 15,8 ± 1,32[a] | 17,3 ± 2,67[ab] | 17,6 ± 2,39[ab] | 18,3 ± 1,68[ab] | 19,9 ± 2,54[bc] | 21,33 ± 1,26[c] |
| Loin muscle depth[2] (cm) | 3,0 ± 0,22 | 3,4 ± 0,15 | 3,4 ± 0,42 | 3,3 ± 0,30 | 3,5 ± 0,59 | 3,6 ± 0,36 |
| Loin muscle width[2] (cm) | 6,8 ± 0,41[a] | 7,3 ± 0,45[ab] | 7,4 ± 0,25[ab] | 7,2 ± 0,50[ab] | 7,5 ± 0,44[ab] | 7,9 ± 0,36[b] |
| Backfat depth[2] (cm) | 1,3 ± 0,37[a] | 3,0 ± 0,64[b] | 4,1 ± 0,48[c] | 5,1 ± 0,34[d] | 5,6 ± 0,43[d] | 5,6 ± 0,50[d] |
| Loin muscle area[3] ($cm^2$) | 15,8 ± 1,67[a] | 17,4 ± 2,86[ab] | 18,2 ± 2,69[ab] | 19,4 ± 2,23[bc] | 20,17 ± 1,43[bc] | 20,67 ± 1,37[c] |
| Loin muscle depth[3] (cm) | 3,3 ± 0,82 | 3,4 ± 0,20 | 3,5 ± 0,29 | 3,4 ± 0,31 | 3,7 ± 0,43 | 3,5 ± 0,30 |
| Loin muscle width[3] (cm) | 6,4 ± 1,03[a] | 6,8 ± 0,21[ab] | 7,2 ± 0,51[ab] | 6,8 ± 0,76[ab] | 7,0 ± 0,56[ab] | 7,4 ± 0,46[b] |
| Backfat depth[3] (cm) | 1,7 ± 0,13[a] | 3,0 ± 0,32[b] | 3,7 ± 0,34[b] | 5,7 ± 0,48[c] | 6,7 ± 0,67[d] | 6,3 ± 0,80[cd] |

[1] - 3 th and 4th lumbar vertebrae; [2] – last rib; [3] - 3 th and 4th last ribs.
Means within the same line with same letter were not significantly different (P>0,05)