# FECT OF pH AND GENETICS ON TEXTURE CHARACTERISTICS OF DRY CURED HAM

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MMARY:

e effect of meat pH and commercial line on texture of dry cured ham was investigated. In the gh pH group, brightness, crumbliness, pastiness, adhesiveness and softness were higher than the low pH group; while hardness, saltiness, non protein nitrogen (NPN), $P_2O_5$, and tyrosine re lower. The blocky line presented the highest values of the following parameters: NPN, rosine crystals, marbling, brightness, crumbliness, pastiness and formation of holes around e hip joint.

## TRODUCTION:

xture is one of the most important characteristics of dry cured ham. The main problems on xture in dry cured ham are:

oft and/or pasty texture, making the slicing process more difficult, and producing a rthcoating sensation rejected by consumers.

Incrustation and formation of holes around the coxofemoral joint, being normally associated th some flavour and aspect defects. In those holes molds could grow, and the mites sometimes esent in hams could refuge there due to the humidity, darkness and presence of molds, making re difficult their elimination. Parolari et al. (1988) reported that softness is favoured by gh levels of intramuscular fat and low salt-to-moisture ratios, particularly in the case of ort cold-resting periods. Pietrain and Belgian Landrace present more problems of soft texture an Italian Landrace and Large White (Parolari et al., 1989). The higher is the temperature the process, the higher will be the incidence of hams with pastiness problems (Arnau et al., 91). The problems of incrustation and formation of holes around the coxofemoral joint are ecially important when the drying rate rises. The aim of this paper is to study the effect meat pH and commercial line on texture of dry cured ham.

## TERIAL and METHODS:

enty hams of pH24>6,2 in the Semimembranosus muscle (HpH), twenty of pH24<5,8 (LpH) and thirty me of three commercial lines of the Pig Improvement Company (L15, with component Duroc; L10, gh muscular development; L03, Comborough) were cured with salt and nitrate after traditional thods in Spain. They were evaluated at the end of the process (6 months for HpH and LpH hams, d 9 months for L15, L10 and L03 hams) by a trained panel test using a randomized complete ock design (Steel and Torrie, 1980). The following characteristics were evaluated: wrinkling, sphate crystals in the outer part of the ham, marbling, brightness, tyrosine crystals, holes the coxofemoral articulation producing an odour similar to a poorly ventilated damp, stiness, adhesiveness, crumbliness, odour and salty taste. The intensity of each of the aracteristics was evaluated using a non structurated scale from 1 to 9. 100 g of ham from the

medium part of Biceps femoris muscle were used for physicochemical analysis. The follow
analysis were carried out: humidity was calculated measuring weight loss at 103 ± 2 °C
constant weight, sodium chloride was analyzed after the method of Charpentier-Volhard, tyrosi
was determined after the Pearson method (1968). $P_2O_5$ (B.O.E., n° 207). Total Nitrogen (Nt) aft
the Kjeldhal method (B.O.E, n° 207). After the precipitation of proteins with tricloracet
acid, NPN was evaluated (Kerese, 1984). A Minolta Chromameter CR-200 was used to objective
measure the L, a and b values. Data were analyzed by the general linear model procedure of S
(1987). The Bonferroni t-tests were used to determine significant differences between means

RESULTS and DISCUSSION:

The highest subjective level of marbling was obtained in L15 hams. The L10 and L03 hams had t
same level of marbling. More NPN, NPN/Nt, tyr concentration, tyr crystals, brightness
pastiness, crumbliness were observed in L10 hams (table 1), indicating a more intens
proteolysis. In these blocky hams, salt needs more time to penetrate into the hams, th
proteolytic process is favoured, but deterioring the quality. The hams from L03 were strongl
salty having the highest NaCl concentration. This could be explained by a lower conformatio
and marbling of L03 hams compared to L10 and L15 respectively. Therefore salt penetration t
the Biceps femoris was accelerated. The holes in the coxofemoral articulation were mo
frequent in the blockiest line (L10) hams. HpH hams were more wrinkled at the end of the proces
than LpH hams. The increased evaporation surface of HpH hams would partially compensate th
highest weight losses normally found in LpH hams. The HpH were soft and deformed easily; thi
could justify a low incidence of holes in the joint. HpH hams showed a lower NPN and t
concentration than LpH, indicating a lower proteolysis level in agreement with the results
Gil et al. (1989) and Arnau et al. (1989, 1991). The concentration of phosphate in the Bicep
femoris was lower in HpH hams than in LpH hams, due to the formation of more $Na_2PO_4H$ crystal
in the outer part of HpH hams than in LpH hams (Arnau et al. 1991). As shown in table 1
brigthness, crumbliness, pastiness, adhesiveness and redness were higher in HpH hams, whil
hardness and saltiness were lower compared to LpH hams ($P<0,05$). Water Holding Capacity
hams, and solubility of meat protein increases with pH, which could explain the higher
pastiness and adhesiveness in HpH hams. Pastiness is also affected by salt concentration a
temperature of the process (Arnau, 1991). Thus raw material and process has to be controlle
in order to avoid textures rejected by consumers.

ble 1 Physicochemical and sensory results[w] obtained from comercial lines (mean±SD).

| rameter | $L_{15}$ | $L_{10}$ | $L_{03}$ |
|---|---|---|---|
| <u>sicochemical</u> | | | |
| ght loss (9 month)[x] | 33,5[b] ± 3,0 | 37,2[a] ± 4,2 | 37,0[a] ± 2,8 |
| idity[x] | 56,5 ± 1,4 | 56,6 ± 2,4 | 54,6 ± 1,9 |
| [x] | 6,03 ± 0,13 | 6,04 ± 0,15 | 5,92 ± 0,09 |
| x100/Nt | 7,91[b] ± 0,36 | 7,55[b] ± 0,56 | 8,80[a] ± 0,46 |
| rosine[y] | 1,39[b] ± 0,10 | 1,63[a] ± 0,14 | 1,47[b] ± 0,08 |
| | 31,20[b] ± 3,57 | 35,73[a] ± 4,34 | 29,45[b] ± 2,12 |
| | 406[b] ± 101 | 545[a] ± 73 | 463[ab] ± 69 |
| <u>sorial</u> | | | |
| rosine spots[z] | 21[b] | 56[a] | 26[b] |
| rkling | 5,6[a] | 2,8[b] | 3,0[b] |
| ghtness | 2,6[b] | 5,5[a] | 2,3[b] |
| ss | 4,0[b] | 6,6[a] | 3,9[b] |
| rkness | 3,5[b] | 6,4[a] | 2,1[b] |
| mpboliness | 3,6[b] | 5,3[a] | 4,4[ab] |
| ughness | 5,6[b] | 5,2[c] | 6,2[a] |

a,b,c: means within a file with different superscript are significantly different P<0,05
The analysis were carried out at the end of the process (9 months) in <u>Biceps femoris</u>.
Percentage in humid basis, y: mgs of tyr per 100 g of ham. z: number of tyr cristals.

ble 2 Physicochemical and sensory results[w] obtained in HpH and LpH hams (mean±SD).

| rameter | HpH hams | LpH hams |
|---|---|---|
| <u>sicochemical</u> | | |
| ght loss (22 days)[x] | 5,4[a] ± 1,38 | 6,9 [b] ± 0,89 |
| ght loss (54 days) | 15,0[a] ± 2,19 | 17,2 [b] ± 1,63 |
| ght loss (88 days) | 21,1 ± 2,89 | 23,4 ± 2,28 |
| ght loss (117 days) | 26,1 ± 3,55 | 28,4 ± 2,88 |
| ght loss (148 days) | 30,7 ± 4,38 | 32,7 ± 4,13 |
| idity[x] | 61,96 ± 2,95 | 61,16 ± 2,08 |
| [y] | 6,57[a] ± 0,09 | 6,11[b] ± 0,11 |
| [x] | 5253[a] ± 539 | 5713[b] ± 581 |
| x100/Nt | 6,71 ± 2,30 | 7,00 ± 2,49 |
| | 0,85[a] ± 0,05 | 0,97[a] ± 0,07 |
| | 20,0[a] ± 1,5 | 22,4[b] ± 1,9 |
| | 159[a] ± 40 | 209 [b] ± 45 |
| | 39,6 ± 4,3 | 38,7 ± 4,4 |
| | 15,5[a] ± 1,6 | 14,2[b] ± 2,0 |
| | 6,7 ± 1,0 | 6,0 ± 1,0 |
| <u>sorial</u> | | |
| rkling | 2,6[a] | 2,1[b] |
| sphate crystals | 3,0[a] | 0,7[b] |
| ss | 2,3[a] | 3,5[b] |
| ghtness | 4,0[a] | 1,6[b] |
| our | 2,7 | 2,8 |
| rdness | 2,5[a] | 4,5[b] |
| mpboliness | 5,1[a] | 3,6[b] |
| rkiness | 2,8[a] | 0,4[b] |
| hesiveness | 4,3[a] | 1,2[b] |
| rfiness | 4,6[a] | 5,1[b] |

a,b,c: means within a file with different superscripts are significantly different P<0,05.
The analysis were carried out at the end of the process (6 months) in <u>Biceps femoris</u>. x: percentage in humid basis. y: ppm. z: mgs of tyr per 100 g. of ham..

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