# INSTRUMENTAL MEAT QUALITY IN NON-CASTRATED AND CASTRATED MALES OF THE CASTELLANA NEGRA BREED.

Ciria, J.; Asenjo, B.; Miguel, J.A.; Calvo, J.L.; Andrés, J.
Area de Producción Animal. Escuela Universitaria de Ingenierías Agrarias de Soria. Universidad de Valladolid.
42004 – Soria. España. jciria@agro.uva.es

## BACKGROUND

The consumption of broiler chicken meat in Spain has experienced a decline during the last years due, among other reasons, to the higher sensitising of the consumers towards sanitary scandals, e.g. meat with dioxines in Belgian chickens and also probably to a certain boredom towards this kind of meat with an organoleptic quality not quite high. Castration modifies the animals' metabolism and therefore the tissue composition, specially the fat quantity. The castration is not always complete and thus it has been observed how a percentage of castrated animal turn their pink-coloured base of the crest into a darker shade of pink, start to emit sounds and become more aggressive. These animals behave half-way between roosters and capons and this factor must be taken into account in the studies about castration (Cubilo *et al.*, 1999).
In the Area of Producción Animal, Escuela de Ingenierías Agrarias of Soria, a test was carried out to compare the meat of chicken in extensive breeding condition and of older age to the slaughter and having a native genetic base (Castellana Negra) with the meat of capons from the same breed; in so doing we will be able to bring to the market a type of quality meat as different to the traditional broiler. On the other hand, we aim to find a economic advantage related to the self-maintenance of this native breed which has been in serious danger of extinction.

## OBJECTIVES

The aim of this paper is the study of the tecnological quality of chickens and capons of the Castellana Negra. It is intended thus to classify this meat obtained from native animals once it has been studied the growth capacity and productive yield in former papers written by the present research group (Ciria *et al* 2001, Miguel *et al* 2001), this study also includes the analysis of sensorial quality of the meat, its results being presented in this convention.

## METHODS

### a) Biological material and methodology.

In the test 110 males of the Castellana Negra were used, they were divided into two groups, one with castrated (55 animals) and the other with non-castrated (55 animals) used for control. Both groups were bred in closed parks until the slaughter, the parks having 12,5 m2 (density of 4 animals per m2). 16 animals in total regenerated testicles.
Castration, with the use of anaesthesia, was carried out at 7 weeks following the technique described by Cubilo y Tor (1996).
Feeding was supply "ad libitum", using the same fodder during the breeding with 2.800 kcal of metabolising energy and 18% of crude protein.
At 33 weeks, 10 animals chosen at random from each group were slaughtered; capons, roosters and regenerated.
The canal yield was determined having been stored the canals at 2ºC following the quartering methodology describe in the work group nº 5 in WPSA (1984).

### b) Technological analysis.

The instrumental analysis was carried out following the methodology proposed by Boccard *et al* (1981).

- Analysis of the Chemical Composition. The moisture content, total nitrogen, fat and ashes were carried out following the Métodos Oficiales de Análisis (BOE 29/8/1979) and the International Regulation ISO R-1442 (moisture), ISO R-1443 (fat), ISO R-936 (ashes) and ISO R-937 (total nitrogen).
- Texture Analysis. The shear force is measured by a texturometre TA-XT2 Texture Analyser with a compression probe (cell Warner-Bartzler), and with a computer software (texture Expert for Windows Operating System).
  The section of the test was carried out perpendicularly to the fibres, at a crosspiece speed of 150mm/min. The data were transferred to a computer, obtaining the highest shear force. It was repeated three times with each sampler, both from breast and rumps in femoral biceps.
- Holding Water Capacity (HWC). HWC was determined by two methods
  1.- *Water loss measurement by firing.* Method described by Lee *et al* (1978) modified.
  2.- .*Water loss measurement through compression.* Method described by Grau y Hamm (1953) and later modified by Sañudo *et al.* (1986).
- Colour Analysis. To analyse the colour a spectrophotometre Minolta was used. Three shots were taken at the same piece; the colour was measured in the skin and in the surface of the musculature of the breast and rump. The coordinates L* a* b* (CIE, 1976) were calculated.
- pH Analysis. The ph measure was carried out with a portatil Crinson pHmeter 507 connected to an electrode of penetration Crison of 6 mm of diametre and a temperature probe, using for the gauge measure a buffer solution at ph 4,00 and 7,02. The mark sensing of the phmetre and the temperature was carried out by incision in the muscles pectoralis and gastronemius, aiming at the contact of the electrode with the muscular tissue. Measures were taken at the slaughter (pH 0) and after 24 hours postmorten (pH24).

### c) Statistic treatment.

The data obtained were analysed by a general lineal model of variant analysis of the computer software SPSS, version 10.0 for Windows.

## RESULTS AND DISCUSSION

Table 1 shows that the pH0 is low in pectorals than in rumps, but that is not the case in the different types of animals; concerning the pH at 24 hours postmorten, the values are higher in the castrated and regenerated animals than in the non-castrated, this may be due to a higher sensibility to stress for those animals whose testicles were extirpated. The index of yellow and red do not show differences between castrated and non-castrated, but they do in the regenerated animals; the index of red is significantly inferior in the rump and breast of the

regenerated than in the castrated or non-castrated. As far as the index of yellow is concerned, also the regenerated, in both muscles, show lower values than the other two.

**Table 1.- Colour and pH analysis in rumps and pectorals of non-castrated, castrated and regenerated of the Castellana Negra native breed.**

| | *NON-CASTRATED* | | *CASTRATED* | | *REGENERATED* | | *SIGNIFICATION* | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Rumps** | **Pectorals** | **Rumps** | **Pectorals** | **Rumps** | **Pectorals** | **Animal type** | **Part** | **AxP** |
| **L*** | 84,36 ±4,55 | 87,49 ±4,40 | 83,86 ±5,90 | 92,70 ±6,37 | 84,45 ±8,79 | 91,93 ±7,65 | n.s | * | n.s |
| **a*** | 19,18 a ±2,59 | 4,68 a ±2,71 | 15,14 a ±3,66 | -0,96 a ±3,69 | 8,18 b ±9,19 | -6,57 b ±10,36 | ** | ** | n.s |
| **b*** | 4,34 a ±1,91 | 3,81 a ±2,27 | 3,41 a ±3,21 | 4,73 a ±3,09 | 0,5 b ±2,30 | -0,09 b ±3,16 | ** | n.s | n.s |
| **pH 0** | 6,40 a ±0,32 | 6,16 b ±0,30 | 6,39 a ±0,13 | 5,91 b ±0,20 | 6,38 a ±0,24 | 6,25 b ±0,27 | n.s | ** | n.s |
| **pH24** | 6,04 a ±0,14 | 5,92 a ±0,10 | 6,31 b ±0,15 | 5,90 b ±0,12 | 6,32 b ±0,16 | 6,11 b ±0,19 | ** | ** | * |

n.s :No significative; * Significative difference (p≤0.05); ** Significative difference (p≤0.001)
Differents letters in the same file hind significative difference between non-castrated, castrated and regenerated (p≤0.05)

Table 2 shows how the fat content of capons and regenerated is higher than in the non-castrated animals, showing also a higher quantity in rumps and breasts in all the animals. The same goes for the protein contents which is significantly superior in the breast for capons, regenerated and roosters than in the rumps for roosters, capons and regenerated.
It is shown as well a higher holding water capacity (measured by firing) in pectorals than in rumps. Both in non-castrated and castrated animals the hardness of the meat is superior in rumps, that may be due to the higher quantity of colagen in this muscles, although the hardness is higher but not significantly in the pectorals of the castrated animals.

**Table 2.- Chemical composition, HWC and hardness of the meat of rumps and pectorals of non-castrated, castrated and regenerated of the Castellana Negra native breed.**

| | *NON-CASTRATED* | | *CASTRATED* | | *REGENERATED* | | *SIGNIFICATION* | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Rumps** | **Pectoral** | **Rumps** | **Pectoral** | **Rumps** | **Pectoral** | **Animal type** | **Part** | **AxP** |
| **%Protein** | 22,22 a ±0,51 | 25,25 a ±0,37 | 22,15 b ±0,63 | 26,15 b ±0,44 | 21,57 c ±0,57 | 25,77 c ±0,44 | ** | ** | ** |
| **%Moisture** | 73,08 ±4,69 | 72,25 ±2,52 | 74,55 ±0,99 | 72,83 ±1,43 | 74,80 ±0,56 | 72,59 ±0,48 | n.s. | ** | n.s. |
| **%Fat** | 2,29 a ±0,38 | 0,94 a ±0,12 | 2,59 b ±0,53 | 1,14 b ±0,15 | 2,57 b ±0,28 | 1,05 b ±0,21 | ** | ** | n.s. |
| **%Ashes** | 1,15 ±0,13 | 1,14 ±0,04 | 1,11 ±0,14 | 1,20 ±0,16 | 1,16 ±0,05 | 1,21 ±0,12 | n.s. | n.s. | n.s. |
| **HWC (firing)** | 21,77 ±1,82 | 12,43 ±0,90 | 21,95 ±2,71 | 13,05 ±1,74 | 21,34 ±3,61 | 10,48 ±1,58 | n.s. | ** | n.s. |
| **HWC (compression)** | 7,81 ±1,51 | 6,13 ±1,15 | 6,09 ±1,64 | 6,19 ±1,57 | 6,53 ±1,36 | 6,88 ±2,41 | n.s. | n.s. | n.s. |
| **Hardness ($kg/cm^2$)** | 4,62 ±1,41 | 3,24 ±1,19 | 3,30 ±0,99 | 3,86 ±1,80 | 4,28 ±1,21 | 3,16 ±1,09 | n.s. | * | ** |

n.s :No significative; * Significative difference (p≤0.05); ** Significative difference (p≤0.001)
Differents letters in the same file hind significative difference between non-castrated, castrated and regenerated (p≤0.05)

## CONCLUSIONS

From the results of the study we may infer that the meat of Castellana Negra capons shows a higher fat quantity than the non-castrated animals from the same breed, that implies a higher organoleptic quality in the meat of this animals, as well as a higher juiciness.

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