

EFFECTS OF TIME AND STORAGE CONDITION ON THE TENDERNESS OF BROILER BREAST MEAT

Souza, Hirasilva Borba Alves¹; Souza, Pedro Alves¹; Pelicano, Elizabete Regina Leone¹; Zeola, Nívea Maria Brancacci Lopes¹; Leonel, Fábio Roberto¹; Oba, Alexandre¹; Lima, Tânia Mara Azevedo¹¹Faculdade de Ciências Agrárias e Veterinárias - UNESP/Câmpus de Jaboticabal - Via de Acesso Prof. Paulo Donato Castellane, s/n; CEP 14884-900 - E-mail: hiras@fcav.unesp.br

Background

The production of broiler carcasses with desirable quality characteristics depends on complete control of the operations involved in the slaughter husbandry of animals, transportation from the farm to the slaughterhouse, waiting in the abattoir, slaughter methods and meat conservation (BRESSAN, 1998). Sensory evaluation indicates that meat tenderness is the palatability attribute more frequently noticed by consumers (CASTILLO, 2001). Although there is a broad acceptability range for tenderness, it is evident that there are advantages for tender meat when other characteristics (taste, succulence, etc.) are constant (BRATZLER, 1976). According to DUNN *et al.* (1995), concerning quality patterns related to the satisfaction of sensory requisites, the importance of tenderness is mainly associated to the general acceptance of the product by the consumer.

Objectives

The objective of the present study was to evaluate the influence of time and storage condition on the tenderness of broiler breast meat.

Methods

Twenty breasts were used to determine cooking losses (CL) and shearing force (SF). CL were determined according to CASON *et al.* (1997). SF was measured according to FRONING & UIJTENBOOGAART (1988); samples were placed perpendicularly to the Warner-Bratzler blade from the Texture Analyzer TA-XT2i apparatus. A completely randomized experiment was used, with four treatments and five repetitions: T₁ – meat cooking and shearing force performed on the same day; T₂ – meat cooked and stored at room temperature, shearing force performed on the following day; T₃ – meat cooked and stored under refrigeration, shearing force performed on the following day; and T₄ – meat packaged and kept under refrigeration for 24 hours before cooking and shearing force analysis. Contrast comparisons among treatment means were made using Tukey's test at 5% of probability level and analysis of variance according to SAS (1996).

Results and Discussion

CL and SF results are shown in Table 1. Treatment influenced (P<0.05) CL. T₁ had the highest CL (24.4 %), significantly different from T₄ that showed the lowest CL (20.4 %). MOREIRA *et al.* (2001) reported similar results when the quality of breast meat from the strains Ross (25.2 %) and Hybro (23.7 %) was evaluated. In contrast, superior results (32.14 %) were reported in a study on the effect of probiotics on the quality of breast meat (LEONE *et al.*, 2001). It is worth noting that cooking losses reduce the nutritional value of the meat, since nutrients may be carried away in the lost exudate, resulting in less tender meat, which was not seen for T₄. FC was also influenced by treatment. T₄ had lower FC (1.59 kgf/cm²) compared to T₃ (2.53 kgf/cm²), resulting in tender meat. The higher tenderness may be explained due to the onset of meat maturation process. According to HEDRICK *et al.* (1994), the maturation process occurs during meat storage in refrigeration temperatures and toughness caused by *rigor mortis* is decreased. For that reason, meat cuts are kept under refrigeration temperatures for long periods in order to achieve the desired texture. Furthermore, according to SEABRA *et al.* (2001), the increase in tenderness results from the action of enzymes, such as calpains. Calpains are calcium-dependent enzymes that degrade some myofibril components and meat becomes tender. Previous studies showed conflicting results concerning SF values that should be established as the threshold for broiler breast meat to be considered tender. DALANEZI (2002) reported mean SF values of 2.14 kgf/cm² for the breast meat of broilers with 42 days. Nevertheless, the incomplete description of the place from where muscle samples were collected for SF measurement makes it difficult to compare texture results from different studies (CONTRERAS, 1995). Shearing force may vary due to the position from which the samples were taken as well as cooking conditions that were used. It is known that CL and SF are quality parameters intimately related to the process of tenderness in meat, which is a determining qualitative factor and one of the most important organoleptic characteristics of meat (KOOHMARAIE *et al.*, 1990). Both parameters have been positively influenced by T₄. Despite the fact that T₄ have caused lower CL and SF, the doubt still remains whether this was in consequence of the treatment or the beginning of the proteolysis process.

Conclusions

Concluding, SF measures should be taken on the same day of cooking (T₁) so that there are no interferences on the process of meat tenderization. If measures are taken in meat that has already been refrigerated for 24 hours (T₄), tenderness cannot be attributed to the treatment but to the onset of meat maturation process.

References

- BRATZLER, L.J. Características organoléptica de la carne. J.F.PRICE and B.S. SCHWEIGERT (eds). *Ciencia de la carne y de los productos carnicos*. Zaragoza: ACRIBIA, S.A. 1976. 668p.
- BRESSAN, M.C. *Efeito dos fatores pré e pós-abate sobre a qualidade da carne de peito de frango*. 1998. 201p. Tese (Doutorado em Tecnologia de Alimentos) – Faculdade de Engenharia de Alimentos, Universidade Estadual de Campinas, Campinas, 1998.

Table 1- Cooking losses (CL) and shearing force (SF) of broiler breast meat as a function of storage time and conditions.

Treatment	Evaluated parameters	
	CL (%)	SF (kgf/cm ²)
T ₁	24.4 ^a	1.94 ^{bc}
T ₂	23.4 ^a	2.23 ^{ab}
T ₃	22.8 ^{ab}	2.53 ^a
T ₄	20.4 ^b	1.59 ^c
CV (%)	6.25	32.32

^a Similar superscripts on the same column are not different by Tukey's Test (5%);

T₁ – meat cooking and shearing force performed on the same day;

T₂ – meat cooked and stored at room temperature, shearing force performed on the following day;

T₃ – meat cooked and stored under refrigeration, shearing force performed on the following day;

T₄ – meat packaged and kept under refrigeration for 24 hours before cooking and shearing force analysis;

CV – coefficient of variation.

- CASON, J.A., Lyon, C.E., Papa, C.M (1997). Effect of muscle opposition during rigor on development of broiler breast meat tenderness. *Poultry Science* v. 76, p. 785-787.
- CASTILLO, C.J.C. Qualidade de carcaça e carne de aves. In: CONGRESSO BRASILEIRO DE CIÊNCIA E TECNOLOGIA DE CARNES, 1., 2001, Campinas. *Anais...*Campinas, 2001. p. 160-178.
- CONTRERAS, C.J.C. *Efeitos do atordoamento elétrico, estimulação elétrica e da desossa à quente na qualidade da carne do peito de frango "Pectoralis major"*. Campinas, 1995. 150 p. [Tese]. Campinas (SP): Faculdade de Engenharia de Alimentos, Universidade Estadual de Campinas.
- DALANEZI, J.A. *Influência da idade da matriz no desempenho, rendimento de carcaça e qualidade do peito de frangos de corte*. Botucatu, 2002. 59p. [Dissertação]. Botucatu (SP): Faculdade de Medicina Veterinária e Zootecnia, Universidade Estadual Paulista.
- DUNN, A.A. *et al.* Contribution of rigor shortening and cold shortening to variability in the texture of *pectoralis major* muscle from commercially – processed broilers. *British Poultry Science*. Langford, v.36, n.3. p. 401-413, 1995.
- FRONING, G.W., UIJTENBOOGAART, T.G. Effect of post mortem electrical stimulation on color, texture, pH, and cooking losses of hot and cold deboned chicken breast meat. *poultry Science*. *Champaign*, v. 67, n. 11, p. 1536-1544, 1988.
- HEDRICK, H.B. *et al.* *Principles of Meat Science*. 3rd Edition. Iowa: Kendall/Hunt Publishing Company, 1994. 354p.
- KOOHARAIE, M. *et al.* Acceleration of post mortem tenderization in lamb and Brahman-cross beef carcasses through infusion of calcium chloride. *Journal of Animal Science*, v. 68, n. 5, p. 1278-1283, 1990.
- LEONE, E.R. *et al.* Utilização de diferentes princípios ativos de probióticos sobre a qualidade de carcaça e de carne de frangos de corte. In: CONGRESSO BRASILEIRO DE CIÊNCIA E TECNOLOGIA DE CARNES, 1., 2001, São Pedro. *Anais...*p.456-457.
- MOREIRA, J. *et al.* Avaliação do rendimento e qualidade de carne em frangos de corte de diferentes linhagens e densidades. In: CONGRESSO BRASILEIRO DE CIÊNCIA E TECNOLOGIA DE CARNES, 1., 2001, São Pedro. *Anais...*p.205-206.
- SAS. *User's guide: stat*, version, 6.12. 4 ed. Cary: SAS Institute, 1996. v.1/2.
- SEABRA, L.M.J. *et al.* O papel das enzimas musculares no processo de maturação de carnes. *Higiene Alimentar*, v.5, n.83, p.15-20, 2001.