

STUDY OF TENDERNESS IN MEAT OF BROILERS REARED IN ORGANIC SYSTEM AND STORED UNDER FREEZING

Hirasilva Borba^{1*}, Aline Giampietro-Ganeco², Rodrigo A. Souza², Juliana L. M. Mello²,
Ana Beatriz B. Rodrigues², Fábio B. Ferrari², Caroline Demarchi³, Pedro A. Souza¹

¹Professor of Technology Department at São Paulo State University – UNESP, Jaboticabal, São Paulo, Brazil

²Post-graduation students at São Paulo State University – UNESP, Jaboticabal, São Paulo, Brazil

³Graduation student at São Paulo State University – UNESP, Jaboticabal, São Paulo, Brazil

*hiras@fcav.unesp.br

Abstract – The objective of this study was to evaluate the behavior of tenderness in the main carcass cuts broiler (breast, thigh and drumstick) in six months under freezing. Were collected 120 Cobb broilers carcasses from the creation of organic system, with slaughter age of 45 days. The analyzes to determine the tenderness of meat were made in refrigerated carcasses and after 3 and 6 months frozen storage. Was analyzed shear force and myofibril fragmentation index in the meat of breast, drumstick and thigh of organic broilers carcasses. This study used a randomized design (periods of storage – 0, 3 and 6 months frozen) with 40 repetitions. The values obtained for shear force decrease breast, thigh and drumstick of meat from carcasses refrigerated to frozen meat from carcasses. And the values obtained for the myofibrillar fragmentation index increase with prolonged storage. This indicates that the freezing provided more tender meat. The carcasses of broilers reared on organic system and stored for six months under freezing, provided for the breast, thigh and drumstick meat tenderness.

I. INTRODUCTION

The quest of the population of healthy foods, with different quality and sensory characteristics has made consumers become more and more demanding for the products available in the market, among them, of animal origin, as well as chicken. An organic diet can bring more benefits to human health than a conventional diet is one of the research challenges of the new millennium. It is known that there is a decrease in total productivity in the organic system, for most crops, notably in the transition period. The poultry production in organic system in Brazil meets Instruction n^o7, the Ministry of Agriculture - MAPA [1], where birds are raised in the pasture area with low density and feed containing certified organic plant ingredients and must not receive chemotherapeutic products. Management of agribusiness sectors involved with the broilers' meat and improvement in the supply chain,

particularly with regard to the high standard of freezing processes and logistics in marketing this product [5]. In the preservation of poultry meat, the freezing process is a fundamental for a natural and practically prevent the development of harmful microorganisms, delaying undesirable chemical reactions, preserve the physical structure unchanged, allow transport to remote areas and ensure health care resource in food handling. The process of preservation through freezing can physically change the poultry meat promoting changes in various components [6]. The objective of this study was to evaluate the behavior of tenderness in the main carcass cuts broiler (breast, thigh and drumstick) in six months under freezing.

II. MATERIALS AND METHODS

In slaughterhouses meat production on a commercial scale, were collected 120 Cobb broilers carcasses from the creation of organic system, with slaughter age of 45 days. These poultry's were fed diets with certified organic ingredients (corn and soybean meal), without animal ingredients and without antibiotics. After collection, carcasses were sent to the Laboratory of Technology of Animal Products Department of Technology of São Paulo State University, maintaining the cold chain, for meat tenderness tests. 40 carcasses were analyzed on the day of collection, considered as refrigerated carcasses. The other 80 carcasses were brought in the freezing tunnel, where 40 were analyzed after three months frozen storage and the other 40 after 6 months frozen storage. The analyzes to determine the tenderness of meat were made in refrigerated carcasses and after 3 and 6 months frozen storage. Was analyzed shear force and myofibril fragmentation index in the meat of breast, drumstick and thigh of organic broilers carcasses.

The shear force (SF) was determined on samples previously boiled in a water bath for 30

minutes (85°C) and cut into approximately 1,5cm² area strips. Samples were submitted to texturometer Texture Analyzer TA-XT2i cut, coupled to Warner-Bratzler device, with fibers disposed perpendicularly to the machine blade, which expressed the strength required to shear sample kgf/cm² [4]. The myofibril fragmentation index of the meat was determined by CULLER et al. [2]. The sample was minced with a scalpel, removing any visible fat or connective tissue and were homogenized with 30 mL of extraction solution containing 100 mM KCl, 20 mM potassium phosphate, 1 mM EDTA, 1 mM MgCl₂ and 1 mM sodium azide. Then, the homogenized solution was centrifuged for 15 minutes at 15,000 rpm at 4 ° C and the suspension of myofibrils the protein concentration by Biuret method described by GORNALL [3] was determined. An aliquot of the suspension of myofibrils was diluted with extraction solution to a protein concentration of 0.5 ± 0.05 mg / mL, was stirred and placed in the bucket and made reading the optical density at 540 nm in a spectrophotometer. This study used a randomized design (periods of storage – 0, 3 and 6 months frozen) with 40 repetitions each broilers organic system, and the results were submitted to analysis of variance using the GLM Procedure of SAS operating system [7] and means were compared by Tukey test at 5% significance.

III. RESULTS AND DISCUSSION

The results obtained shear force and myofibril fragmentation index in the meat of breast of organic broilers carcasses are shown in Table 1. It is possible to observe that there was no statistical difference for the analysis of breast meat tenderness in broilers. The breast meat only from refrigerated carcasses were less tender compared with the breast meat carcasses frozen for a period of three and six months of storage. The values obtained for shear force decrease breast meat from carcasses refrigerated to frozen meat from carcasses. And the values obtained for the myofibrillar fragmentation index increase with prolonged storage. This indicates that the freezing provided more tender meat.

Table 1 Mean values for shear force (SF) and myofibril fragmentation index (MFI) of breast meat from organic system broilers

| | SF | MFI |
|-------------------------|---------|----------|
| Refrigerated | 1.864 A | 73.72 C |
| 3 months frozen storage | 1.446 B | 188.12 B |
| 6 months frozen storage | 1.587 B | 251.05 A |
| P-value | 0.003 | <0.0001 |
| CV(%) | 9.13 | 6.50 |

For a given factor, means followed by distinct letters differ according to Tukey test. (P<0.05); (P<0.01). The following abbreviations are used CV, coefficient of variation

The results obtained shear force and myofibril fragmentation index in the meat of thigh of organic broilers carcasses are shown in Table 2.

Table 2 Mean values for shear force (SF) and myofibril fragmentation index (MFI) of thigh meat from organic system broilers

| | SF | MFI |
|-------------------------|---------|-----------|
| Refrigerated | 2.324 A | 54.96 C |
| 3 months frozen storage | 1.454 B | 122.217 B |
| 6 months frozen storage | 1.641 B | 248.960 A |
| P-value | <0.0001 | <0.0001 |
| CV(%) | 10.26 | 5.61 |

For a given factor, means followed by distinct letters differ according to Tukey test. (P < 0.05); (P < 0.01). The following abbreviations are used CV, coefficient of variation.

It is possible to observe according to Table 2, the thigh meat carcasses studied showed the same behavior of the breast in relation analyzes verify the tenderness studied.

The results obtained shear force and myofibril fragmentation index in the meat of drumstick of organic broilers carcasses are shown in Table 3.

Table 3 Mean values for shear force (SF) and myofibril fragmentation index (MFI) of drumstick meat from organic system broilers

| | SF | MFI |
|-------------------------|---------|----------|
| Refrigerated | 2.849 A | 59.64 C |
| 3 months frozen storage | 1.520 B | 117.25 B |
| 6 months frozen storage | 1.281 C | 196.14 A |
| P-value | <0.0001 | <0.0001 |
| CV(%) | 5.36 | 7.05 |

For a given factor, means followed by distinct letters differ according to Tukey test. (P < 0.05); (P < 0.01). The following abbreviations are used CV, coefficient of variation.

The variation in tenderness can be a problem detected in the meat because the hard flesh can pass to the final consumer the impression of an older animal. Additionally, the storage process studied in this work, the freezing, can physically change the quality of the meat.

More the freezing can increase food preservation for an extended time. In breast meat, drumstick and thigh of broilers reared under organic system and stored, it was observed that the freezing provided to increase the tenderness of meat studied.

IV. CONCLUSION

The freezing for up to six months favors the increase of tenderness in breast, thigh and drumstick meat from broilers reared in organic system.

ACKNOWLEDGEMENTS

To Foundation for Research Support of the State of São Paulo (FAPESP) for the support provided (case number 2012/10276-0) and Korin Agriculture for their support and availability.

REFERENCES

1. Brasil. (1999). Instrução Normativa n.º 7, de 17 de maio. Ministério da Agricultura, Pecuária e Abastecimento.
2. Culler, R. D. (1978). Relationship of myofibril fragmentation index to certain chemical, physical and sensory characteristics of bovine longissimus muscle. *Journal Food Science*. 43:1177-1180.
3. Gornall, A. G. et al. (1949). Determination of serum protein by means of the biuret reaction. *Journal Biology Chemical*. 177:751-766.
4. Lyon, C. E. et al. (1998). Effects of carcass stimulation, deboning time, and marination on color and texture of broiler breast meat. *Journal of Applied Poultry Research*. 7:53-60.
5. Vieira, E. T. T. (2007). Influência no Processo de Congelamento na Qualidade do Peito de Frango. Universidade Regional Integrada do Alto Uruguai e das Missões. URI. Dissertação de Mestrado em Engenharia de Alimentos. Available in: <http://www.uricer.edu.br/cursos/arq_trabalhos_usuario/569.pdf>. Accessed in april 18, 2011.
6. Souza, G.C. (2007). Detecção de Betalactamases de Expectro Expandido (ESBL) em Cepas de Coliformes Isoladas da Carne de Frango Comercializada na Cidade de Fortaleza, Ceará. Universidade Federal do Ceará. Dissertação de Mestrado em Tecnologia dos Alimentos. Available in: <http://biblioteca.universia.net/irARecurso.do?page=http%3A%2F%2Fwww.teses.ufc.br%2Ftd_e_busca%2Farquivo.php%3FcodArquivo%3D1492&id=36772019>. Accessed in may 25, 2011.
7. SAS Institute. (2002). SAS user's guide: statistics. Release 8.02. Cary.