LONG-TERM STORAGE ON CHEMICAL COMPOSITION OF CHICKEN BREAST MEAT AFFECTED BY WOODEN BREAST MYOPATHY

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I. INTRODUCTION

Wooden breast myopathy is characterised by accentuated hardness on palpation of chicken breast, with production of mucous exudate, petechiae and white stripes, as well as areas with separate muscle bundles, particularly within deep layers of the muscle in different severity degrees [1]. Those injuries not only negatively affect visual characteristics of the breast but also decrease the product yield during processing, which results in economic loss to producers and to the industry. Besides, meat quality declines over long periods of storage [2] and it might be more intense in chicken affected by wood breast myopathy. Thus, the present study proposes to evaluate the variations in chemical compositionof chicken wooden breast meat under different degrees of severity throughout 12 months of freezing.

II. MATERIALS AND METHODS

A total of 300 chicken breasts from Cobb 500 male broilers, at 42 d of age, were collected in a commercial slaughterhouse inspected by the Federal Inspection Service in Brazil. Boneless and skinless samples were classified immediately after boning [3], as follows: moderate degree (n=100) – breast hard in cranial region and pale in colour; severe degree (n=100) – breast hard throughout its entire length, accompanied or not by white stripes. 100 normal samples (without myopathies - control group) were also collected. Part of the samples (normal (n=20); moderate (n=20) and severe (n=20)) were analysed at the collection date. The remaining samples (normal (n=80), moderate (n=80) and severe (n=80)) were packed in plastic bags prior to rapid-freezing (-40°C). Afterwards, they were stored at -18°C for up to 12 months, maximum shelf life recommended for frozen chicken meat [4]. Chemical composition was determined at the end of each proposed freezing period (0, 3, 6, 9 and 12 months) by analysing the content of moisture, protein and ash [5] and the concentration of total lipids [6].

III. RESULTS AND DISCUSSION

No interaction ($P>0.05$) was observed between severity degree and storage time. However, breasts affected by the myopathy presented higher ($P<0.001$) moisture compared to normal samples, due to the presence of edema as result of inflammatory process [7]. Decrease in moisture percentage (71.74%) was only observed after 12 months of freezing due to water loss through the exudate. During freezing process, ice crystals damage myofibrillar structures, causing extraction of intracellular water to the extracellular environment. During thawing, water is exudated, decreasing the moisture due to the damage of myofibrils, preventing the water reabsorption into intracellular spaces as storage time increases. Lower ($P<0.001$) mineral matter content was observed as the severity degree increased (1.54%, 1.36% and 1.22%; normal, moderate and severe, respectively), probably caused by the greater production of exudate, product of myodegeneration, eliminating hydrophilic components (such as mineral matter) in addition to water. There was reduction ($P<0.001$) in mineral matter content over the storage period, mainly due the loss of soluble material [8]. The results can be seen in Table 1.

Table 1. Chemical composition of chicken wooden breast meat stored for up to 12 months.

	Moisture (%)	Mineral Matter (%)	Protein (%)	Fat (%)
		Severity Degree (G)		
Normal	71.9^{B}	1.5^{A}	23.3^{A}	2.7^{B}
Moderate	72.7^{A}	1.4^{B}	22.0^{B}	3.0^{B}
Severe	72.8^{A}	1.2^{C}	20.0^{C}	3.2^{A}
		Storage Time (T)		
Beginning	72.9^{A}	1.5^{A}	23.7^{A}	2.2^{B}
3 months	72.6^{A}	1.5^{A}	23.6^{A}	2.3^{B}
6 months	72.6^{A}	1.2^{D}	22.1^{B}	2.9^{A}
9 months	72.6^{A}	1.3^{C}	21.3^{B}	2.3^{B}
12 months	71.7^{B}	1.4^{B}	20.0^{C}	2.7^{A}
		P-value		
P (G)	<0.001	<0.001	<0.001	<0.001
P (T)	<0.001	<0.001	0.025	0.016
P Int (GxT)	0.515	0.092	0.088	0.425

$^{A-D}$ Means followed by distinct letters (in columns) differ from each other by the Tukey test (P<0.05).

There was a decrease in protein content with the increase of wooden breast myopathy degree, resulting from the myodegeneration of muscle fibers. The system tries to replace those damaged fibers with connective and adipose tissue, by promoting fibrosis and lipidosis, decreasing the amount of myofibrillar proteins and increasing fat content in the muscle. Samples stored for 12 months also showedgreater protein losses (P=0.025) and fat gains (P=0.016) in relation to fresh samples due to the denaturation of myofibrillar proteins caused by long-term storage. As part of soluble material, protein fraction was exudated, increasing the concentration of hydrophobic compounds such as fat [8].

IV. CONCLUSION

The greater the degree of wooden breast myopathy severity, the greater the moisture and fat contents and the lower the mineral matter and protein contents in the chicken breast. Chemical composition of chicken breast in general is also altered during long-term storage with less amount of moisture, mineral matter and protein towards the freezing period advance.

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