MYOWATER CHANGES DURING THE FIRST 24 H POSTMORTEM RELATED TO BROILER BREAST FINAL MEAT QUALITY

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I. OBJECTIVES

The objective of this study was to provide insight on changes in myowater (muscle tissue water) mobility and distribution in broiler breast fillets during the first 24 h postmortem (PM) related to final meat quality.

II. MATERIALS AND METHODS

From 12 broiler carcasses, right breast fillets were deboned at 15 min PM (hot deboned), and the left fillets were deboned at 2 h PM (post-chilling). Nuclear magnetic resonance (NMR) traits (T_{2B}, T_{21}, T_{22}, P_{2B}, P_{21}, P_{22}) of individual fillets (197 ± 35 g) were repeatedly assessed at 0.75, 1.25, 2, 3, 4 and 24 h PM (right fillets) or 2, 3, 4, and 24 h PM (left fillets). At 24 h PM, color (*L*a*b**) was measured on the middle and caudal portions of fillets (bone side), drip loss and cook loss were determined on subsamples excised from the cranial portion, and total moisture content was determined. A one-way analysis of variance mixed model was performed to evaluate PM time as a fixed effect within deboning time with carcass as a random effect. Pearson correlation analysis within deboning time was performed to assess the relationships between NMR and quality traits.

III. RESULTS

In hot-deboned fillets, the mobility (T) and proportion (P) of the water tightly bound to macromolecules (T_{2B} and P_{2B}), intra-myofibrillar (T_{21} and P_{21}) H_2O, and extra-myofibrillar H_2O (T_{22} and P_{22}) were strongly influenced by PM time. Bound water exhibited the highest mobility ($P < 0.0001$) coupled with the lowest proportion ($P = 0.0036$) between 2 and 4 h PM. The mobility of the intra-myofibrillar water compartment (T_{21}) decreased from 0.75 to 2 h PM and then increased from 3 to 24 h PM ($P = 0.0002$). The proportion of intra-myofibrillar water (P_{21}) was at its minimum at 1.25 h and then reached its peak at 4 h PM (1.25 h = 69.8% vs. 4 h = 79.2%; $P < 0.0001$). The mobility of the extra-myofibrillar water compartment (T_{22}) was steady between 0.75 and 4 h PM and then decreased to reach its minimum at 24 h ($P < 0.0001$), while P_{22} reached its peak at 1.25 h and then decreased to its minimum at 4 h PM (1.25 h = 29.5% vs. 4 h = 20.1%; $P < 0.0001$). The NMR traits of fillets subjected to post-chill deboning exhibited similar trends. The correlation analysis revealed that, at 24 h PM, total moisture content was highly correlated to T_{21} ($r = 0.78$) and P_{22} ($r = 0.76$), but negatively related to P_{21} ($r = -0.75$). However, moisture content at 24 h PM was most highly correlated to T_{21} measured at 2 and 3 h PM ($r = -0.85$). For drip loss, the only significant correlation found was with T_{22} at 1.25 h ($r = 0.71$). Cook loss was moderately related to T_{21} at all the time points ($r = 0.70$) and with T_{2B} and T_{22} at 2 and 3 h PM. As for the color traits, lightness values exhibited a moderate correlation with T_{21} at both 1.25 h ($r = 0.64$) and 2 h PM ($r = 0.52$). At 0.75 h, redness was correlated with T_{2B} ($r = 0.72$); at both 1.25 and 2 h PM, a^* was moderately and positively correlated with bound water fractions but negatively related with P_{22} ($r = -0.60$). Yellowness was only related to T_{2B} at 0.75 h ($r = 0.64$).

IV. CONCLUSION

Data from this study indicate that changes in myowater distribution and mobility occur in breast fillets within the first 24 h PM and suggest that myowater properties within the first 3 h PM may play a role in determining the final moisture content, water-holding capacity, and color traits of broiler breast meat.

Keywords: chicken breast meat, final meat quality, nuclear magnetic resonance, postmortem time