



Muscle pH and Freezing affect Protein Functionality in Turkey Meat

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Summary

Turkey with pale, soft, exudative (PSE)-like characteristics is one of the growing concerns in the poultry industry as it affects meat quality. The loss of protein functionality in low pH poultry meat may have serious consequences as it reduces suitability for the production of further processed products. Freezing can also cause biochemical and quality changes in meat.

Problem

Recently, increasing consumer demand for turkey products has shifted turkey sales from whole birds to further processed products. Functionality of meat proteins plays an important role in the production of further processed products. Muscle ultimate pH at 24 h *post-mortem* (pH₂₄) and freezing has important influence on the functional properties of proteins in poultry meat. One of the challenges in the production of further processed meat products is the utilization of PSE (pale, soft, exudative) and DFD (dark, firm, dry) meat, with low and high pH₂₄, respectively. PSE problem costs the turkey industry at least \$200 million/year due to reduced protein functionality in further processed products. DFD meat is not a major concern in processing, however; it appears darker in color, which affects the color of processed products and consumer acceptability. As the demand for further processed products increases, there is a need for industry to search for ways to utilize these types of meat depending on their functionality.

The major objective of this study was to determine the biochemical and functional properties of proteins in turkey breast meat with different ultimate pH at 24 h *post-mortem* (pH₂₄) in fresh and frozen storage.

Approach



pH = 5.70 ± 0.04 (n=8) 6.00 ± 0.06 (n=8) 6.32 ± 0.15 (n=8) Total = 24
Mean ± SD

Samples were minced individually and equally split into 2 portions for fresh and frozen analyses

Storage conditions:
Fresh: 4°C
Frozen: -30°C (3 weeks)

- Ca²⁺-ATPase Activity
- Protein Solubility
- Total and Reactive Sulfhydryl
- Surface Hydrophobicity
- Carbonyl Content

Figure 1. Schematic diagram of study design

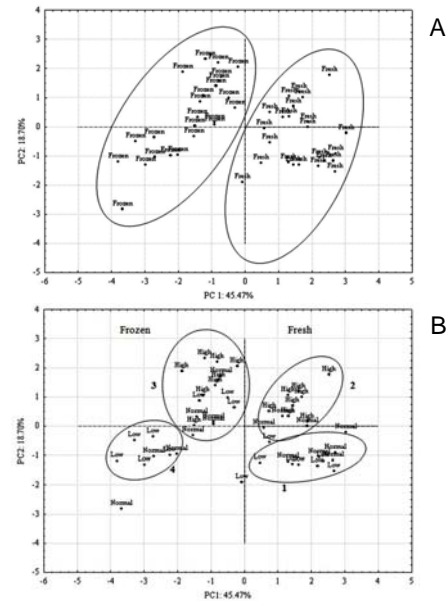


Figure 2. Principal component analysis
A: Freezing, B: pH

Observations

Low and normal pH meat showed similar properties indicating their similarity in the extent of protein denaturation. High pH meat had higher protein solubility compared to low and normal pH meat, and hence expected to have better functional properties. Freezing caused denaturation and oxidation of proteins as revealed by decrease in Ca²⁺-ATPase activity, total protein solubility, reactive and total sulfhydryl groups, and increase in formation of carbonyl groups. Principal component analysis (PCA) (Figure 2.) supported these findings. When searching for valid tools to discriminate the quality of low and normal pH poultry meat, other biochemical or biological characteristics needs to be evaluated.

Conclusion

Thorough understanding of the biochemical and functional properties and their relationships will assist processors in optimizing the use of the different types of meat according to their protein functionality.

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