Label-free Biomarkers of post-mortem aging and salt processing in fish to improve processes and food properties

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Predicting the metabolic shifts induced by post-mortem changes or various processing methods is crucial in maximizing food performance. This study aims to better understand the characteristics of trout river fish muscle, in salted and non-salted fillet, over the post-mortem aging. To do so, a comprehensive analysis (multi-scale multi-disciplinary) was performed to assess the structural and biochemical properties of fish filet over 15 days. Surprisingly, the post-mortem time impacted very little the denaturation of proteins and tissues micro-structures. However, post-mortem aging was responsible for quicker absorption of the salt, as HPLC analyses showed the salt concentration in aged samples was 2 to 4 times higher than at the beginning of the post-mortem time. Additionally, dry-salting caused a strong denaturation of the structural properties of muscles. Finally, label-free spectroscopy (FTIR) was used to detect slow metabolic shifts in tissues. Spectral fingerprints were processed with machine learning to predict with high confidence the biomarkers of post-mortem aging and salting. Data were then correlated to conventional biochemical analyses. We conclude that better food performance can be achieved by adapting processes accordingly to the structural and biochemical characteristics of the fillet.