Effects of Ultra-High-Pressure Processing on Fish Quality

陳佑昀 (5135)

2025/11/12

Outline

1. Introduction
2. Effects of High-Pressure Processing on Fish Quality
   2.1 Shelf-life evaluation of sardines under high-pressure processing (HPP)
   2.2 Quality effects of ultra-high pressure (UHP) combined with carnosine on snakehead
3. Conclusion

Abstract

Ultra-high pressure (UHP) is recognized for extending the shelf life of fish, yet its effects on quality attributes (color and texture) and on the mechanisms of fishy off-odor formation remain incompletely defined. In particular, species differences and the role of co-applied antioxidants need clarification. Drawing on two studies (sardine and snakehead), we examine how UHP modulates color, texture, and volatile organic compounds (VOCs) during refrigerated storage, and whether combining UHP with carnosine more effectively suppresses lipid oxidation and fishy odor. By the end of storage, pressure-treated samples consistently limited lipid oxidation versus controls. Sardines showed lower ketone proportions at day 14 in HPP groups (25.3–33.6%) compared with the control (40.5%). In snakehead, the UHP + carnosine combination (CUH; 25 mM carnosine, 300 MPa for 900 s) markedly reduced the lipid-oxidation marker MDA by 51.04% versus control at day 9, whereas carnosine alone (CAR) mainly acted early (−13.15% on day 3; −2.71% on day 9). Regarding odor, both studies indicate suppression of off-flavors under pressure. In sardines, HPP samples maintained lower proportions of oxidation-related volatiles at day 14, and hexanal and 2,4-hexadienal appeared only in controls. In snakehead, CUH significantly lowered fishy VOCs at day 9 (e.g., aldehydes −40.6%, alcohols −71.5%, ketones −38.9% vs control), confirming a synergistic deodorizing effect when UHP is combined with carnosine. For appearance and structure, sardines retained higher hardness and lightness (L)* throughout 14 days after HPP, whereas controls discolored and deteriorated sooner. In snakehead, CUH limited the rise of MDA and—compared with UHP alone—mitigated whitening while preserving acceptable color/texture, indicating that oxidation and odor formation can be delayed without compromising quality. This work centers on high-pressure technology's impact on fish matrices and the co-action of carnosine. Across the two models, HPP/UHP suppressed oxidative reactions, reduced odor-active volatiles, and

helped maintain color and texture. Notably, the combined UHP + carnosine treatment enhanced inhibition of VOCs and trimethylamine nitrogen (TMA-N) while offsetting pressure-induced lipid oxidation, supporting its promise for odor control and shelf-life extension.

Reference

Ismaiel, L., Nartea, A., Fanesi, B., Lucci, P., Pacetti, D., Jaeger, H., & Schottroff, F. (2025). Effect of High-Pressure Processing on Color, Texture and Volatile Profile During Sardine Refrigeration. *Foods*, 14(2) 329.

Sun, L., Lv, J., Liu, Y., Zang, M., Li, P., Wang, D., ... & Xu, W. (2022). Effects of combined carnosine and ultra-high pressure on the inhibition of fishy off-odor of snakehead fillets and the possible mechanism. *Food Chemistry*, 395, 133615.