Oxidative stability of menhaden fish oil-in-water emulsions stabilized by protein-polysaccharide complexes: Effect of pH and salt

Mara Krempel, Hayley Moss, Hanna Khouryieh

Abstract

The objective of our research is to improve to oxidative stability of menhaden fish oil-in-water (O/W) emulsions by incorporating whey protein isolate (WPI) complexes containing xanthan gum (XG) and locust bean gum (LBG) into the aqueous phase. The impacts of sodium chloride (0, 5, 50 mM) and pH (3 and 7) on the stability of these emulsions were investigated on emulsions consisting of WPI, WPI-XG, WPI-LBG, and WPI-XG-LBG. The oxidative stability of these emulsions was tested by measuring lipid hydroperoxide (PV) and thiobarbituric reactive substance (TBARS) concentrations over an 8-week storage period. At 0mM, XG-LBG emulsions displayed the lowest concentrations of PV at both pH values, meaning it had the highest stability. At all salt concentrations, XG-LBG at pH 7 resulted in the highest stability by displaying the lowest TBARS values. XG-LBG did not have higher stability than XG at pH 3, which resulted in the highest TBARS stability at pH 3 at all salt concentrations. Emulsions containing WPI-LBG and just WPI did not show enhanced stability. The improved stability seen in emulsions containing the XG-LBG mixture and just XG at pH 3 can be explained by the electrostatic interaction between the anionic XG and cationic WPI at this pH. Based on the combined PV and TBARS results, it is concluded that WPI-XG-LBG emulsions display the highest oxidative stability of all emulsions, regardless of salt or pH. These conclusions will aid in the distribution of omega-3 polyunsaturated fatty acids into the public diet, allowing for healthier and longer-lasting food products.