

Thermal and non-thermal decontamination of food formulations containing phycocyanin influence of media pH and process intensity of quality characteristics and microbial inactivation

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Phycocyanin (PC) is a natural blue food colorant derived from microalgae, which has become an increasingly popular and sustainable alternative to chemical food additives. Due to its nature as a protein, various external influences lead to color losses, therefore limiting preservation of PC formulations by conventional treatments. Thus, the presented study is focusing on non-thermal decontamination of PC formulations at pH 3 and 7. Inactivation of *Listeria innocua* (Gram+) and *Escherichia coli* (Gram-) by Pulsed Electric Fields (PEF; 32 kV/cm, up to 200 kJ/kg) and high pressure processing (HPP; 600 MPa, up to 10 min) was investigated and compared to short-time thermal pasteurization (up to 70 °C, 2 s). Color retention as well as reversibility of protein aggregation were evaluated. Results showed sufficient inactivation levels for all treatments, which were facilitated at pH 3. In contrast to thermal effects, protein aggregation caused by low pH and short HPP exposure (? 2.5 min, 600 MPa) were shown to be reversible. For PEF treatment, the electric field itself did not seem to affect the proteins, however, especially at neutral pH the required high energy input levels and the associated temperature increase lead to irreversible protein aggregation. Altogether, process windows could be determined which allow for a sufficient microbial inactivation while simultaneously providing a best possible retention of PC color activity, therefore contributing to the industrial implementation of these technologies.