

HIGH PRESSURE THERMAL STERILIZATION OF EGG PRODUCTS

Abstract

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High pressure low temperature processing technology is an industrial reality as witnessed by the production of a number of pasteurized and extended shelf life foods offered today in the world market. However, the development of shelf stable low-acid foods requires combining high hydrostatic pressure with high temperature to achieve commercial sterility. This dissertation includes a general overview of high pressure high temperature technology (HPHT), with special focus on the development of HPHT treated shelf stable egg based products.

Chapter 1 reviews the *state of the art* of the technology for the production of low-acid shelf stable products. It includes the latest on design requirements for HPHT processing equipment, microbial spore inactivation, and quality retention. In particular, this chapter provides a review on comparisons between HPHT treated and canned products in terms of processing time and quality degradation. HPHT process validation tools to demonstrate microbial efficacy and facilitate regulatory approval of novel HPHT treated products are also described.

A comprehensive feasibility study was conducted to evaluate HPHT treatment as an alternative to conventional thermal processing to stabilize egg-based products. This study was initiated

based on a US Army need to substitute retorted scrambled eggs, unappealing to military consumers, due to green color formation and off-flavor development after thermal processing. Chapters 2, 3, and 4 cover some of the outputs from this study on selected precooked scrambled egg patties focusing on HPHT process design and end product quality.

Chapter 2 presents results on quality evaluation of precooked egg patties after high pressure treatment at low and high temperatures. The importance of egg formulation modification with xanthan gum and flavors to maintain initial quality after high temperature pressurization is demonstrated. Chapter 3 analyzes selected methods for improving texture profile and water retention of scrambled egg patties after HPHT treatment. Among tested methods, addition of cheese particles into the egg mix, lower product porosity than the standard product, and low vacuum packaging contributed in different extents to improve texture and water retention in HPHT treated patties.

Chapter 4 evaluates consumer acceptability of commercial egg patties after HPHT treatment and in-pouch retort processing. Egg patties with added process cheese was the most acceptable formulation after treatment at 700 MPa/105°C, maintaining most quality parameters after pressurization. Overall results demonstrated that thermal pressurization processing can be a promising alternative to conventional thermal processing for the development of novel shelf stable egg-based products.