EFFECTS OF HIGH PRESSURE PROCESSING AND ETHYL LAUROYL ARGINATE ON THE SHELF-LIFE OF READY-TO-EAT SLICED CHICKEN BREAST ROAST

A Thesis

submitted in partial fulfillment of the requirements for the degree of

Master of Food Technology

Massey University

Albany, New Zealand

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August 2011

ABSTRACT

Title: Effects of high pressure processing and ethyl lauroyl arginate on the shelf-life of ready-to-eat sliced chicken breast roast.

High pressure processing (HPP) is becoming increasingly popular in commercial food processing as it offers great potential within the food industry. The popularity of the technology is driven by the need to provide minimally processed foods which are safe, wholesome and have extended shelf-life that challenge traditional methods of food processing. High pressures of upto 900 MPa can be used to kill or inhibit microorganisms without changing the nutritional and sensory properties of the food. However, the inherent high resistances of bacterial endospores and food enzymes are the major challenges for the broader application of HPP. Therefore, a hurdle approach is almost axiomatic for significant widespread use of HPP in commercial food processing. Therefore, several antimicrobial compounds have been used in conjunction with HPP in a hurdle approach to improve the overall quality of the products. Ethyl lauroyl arginate (LAE) has not been investigated in combination with HPP. LAE is a novel antimicrobial compound derivative of lauric acid, L-arginine and ethanol, all of which are naturally occurring substances. LAE can extend the shelf-life of products due to its antimicrobial action on spoilage microorganisms during refrigerated storage. Therefore, the objective of this study was to investigate the effects of HPP and LAE on the shelf-life of ready-to-eat (RTE) cooked chicken breast roast during storage at 4°C for 16 weeks. The RTE cooked chicken breast roast was prepared using portions (samples) of freshly marinated chicken breasts, which were cooked to an internal temperature of 75°C for 5 minutes, and then cooled (4°C), sliced (60 mm) and vacuum-packaged. The study was conducted in two phases, each carried out for 16 weeks. The first phase comprised of fourteen unique treatments which were screened by microbial and instrumental analysis. Based on the results of the first phase, five treatments were selected for further work. Similar tests were carried on these treatments, in addition to sensory evaluation.

The effects of HPP at 450 MPa and 600 MPa pressures at 1 min, 3.5 min and 5 min hold times respectively, on the shelf-life of RTE sliced chicken breast roast were studied for 16 weeks during storage at 4°C. HPP in combination with LAE (200 ppm) was also investigated using similar treatment pressures, hold times and storage conditions. The effects of LAE (200 ppm & 315 ppm) alone on the shelf life of RTE sliced chicken breast roast was studied for 16 weeks when stored at 4°C. RTE sliced chicken breast roast samples without any preservative and/or HPP treatment served as the controls. Aerobic plate counts (APCs), lactic acid bacteria (LAB) and yeasts and moulds (Y&M) were analyzed in five samples from each of the treatments at regular intervals for upto 16 weeks. Instrumental analyses of color and texture were also conducted on the samples to determine any significant changes during storage at 4°C. Five sample treatments were selected after screening and evaluated by consumer sensory analysis using a 9-point hedonic scale. Analyses for APCs, LAB, Y&M, color and texture were also conducted on the selected samples during refrigerated storage. Survival analysis methodology was used to estimate the consumer sensory shelf-life of the selected treatments at 25% and 50% rejection probability.

The results showed the potential of using HPP to extend the microbiological and consumer sensory quality of the products. Samples treated with HPP alone, and HPP in combination with LAE (200 ppm) at 600 MPa inhibited the growth of APCs for 16 weeks when stored at 4°C. However, there was no significant (P>0.05) difference in the microbial shelf-life of samples treated with 200 ppm or 315 ppm LAE. No significant (P>0.05) changes in color and texture were detected in all the treatments. Further, no LAB or Y&M were detected in all the sample treatments for the entire storage period at 4°C. Samples treated with HP at 600 MPa for 1 min and 5 min, HPP+LAE (200 ppm) at 600 MPa for 1 min, LAE at 200 and 315 ppm were evaluated by a consumer sensory panel at different storage times. The results of the consumer sensory analysis showed no changes in color, texture, flavour and freshness of the HP-treated and HPP+LAE (200 ppm)-treated samples. LAE-treated (200 and 315 ppm) samples were not acceptable by a consumer panel at week 12. A maximum sensory shelf-life of >16 weeks at 50% and 13.8 weeks at 25% rejection probability was obtained for samples treated with HPP at 600

MPa for 1 min. Therefore, samples treated at 600 MPa for 1 min had stable sensory properties and were well-accepted by a consumer panel. Also, the samples had good microbiological quality.

ACKNOWLEDGEMENTS

There are several people and organizations I would like to thank for their help when I pursued the Master's in Food Technology at Massey University. Without their support, my stay in New Zealand would not have been fruitful.

I would like to thank God for gifting me this beautiful life and giving me the ability to reason, judge and be a good human being.

I would like to acknowledge the financial support given by Tegel Foods Ltd to conduct this project and I would like to thank Roy Biggs, Food Safety and Quality Assurance Manager at Tegel Foods Limited, who gave me this wonderful opportunity to work on a commercial project. Also, I would like to specially thank Robyn Marshall for sharing her technical skills, supervision and invaluable contribution. I would like to acknowledge the full team at Tegel Foods Ltd, Christchurch, who contributed towards the physical completion my project.

I would like to express my deepest appreciation and gratitude to my supervisor, Dr. Tony Mutukumira, who continually and convincingly conveyed a spirit of adventure in regard to research. Without his guidance and persistent help this project report would not have been possible. Thank you for believing in me and supporting me throughout my post-graduate studies and life.

I would also like to thank Rachel Liu, Jarod Young and Marjan Asgarlou for their assistance in the laboratory during the course of the project. I would also like to immensely thank Daniel Walsh for his help with the statistics in this project.

Finally, I would like to thank the people who make my life worth living. I would like to express my love and gratitude to my loving family for their endless love and support. I would like to specially thank my best friend Sneha Prakash for her help and support throughout the project. I am very grateful to have Deepak Menon as my partner, who is my source of strength and inspiration.

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ABBREVIATIONS

ANOVA	=	Analysis of variance
APCs	=	Aerobic plate counts
CFD	=	Computational fluid dynamics
FDA	=	Food and drug administration
FE	=	Finite Element
GRAS	=	Generally recognized as safe
HP	=	High pressure
HPP	=	High pressure processing
KPa	=	Kilo pascals
LAB	=	Lactic acid bacteria
LAE	=	Lauric arginate
MPa	=	Mega pascals
RTE	=	Ready-to-eat
SD	=	Standard deviation
Y&M	=	Yeasts and mould