

SNAPSHOT

HIGH PRESSURE PROCESSING FOR SHELF LIFE EXTENSION OF FRESH MEAT

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Project Description

This project investigated the potential of high pressure processing (HPP) as a processing technology for the extension of shelf life of fresh meat products whilst ensuring minimal impact on appearance, texture, yield and eating quality.

Project Content

HPP is an established processing technology in the food industry for the shelf life extension of many products, including ready-to-eat meat products. HPP conditions for this cold pasteurisation process involves pressures of up to 600 MPa at ambient temperatures for a few minutes. The appearance of fresh meat is impacted at this pressure, with the meat becoming lighter and paler. Therefore, this limits the usefulness of HPP for the extension of shelf life of fresh meat products. This project investigated the limits of high pressure that can be applied to fresh meat for maintaining a 'close to fresh' meat appearance with extended shelf life and negligible impact on meat quality attributes. This was achieved through four stages:

- 1) defining the pressure limits for colour stability and indicative shelf life of fresh meat;
- 2) verifying the optimum HPP conditions at pilot scale;
- 3) assessment of the shelf life stability and eating quality of pressure-treated meat portions at two storage temperatures; and
- 4) investigation of the impact of HPP on shelf life and meat quality of sliced steaks.

Project Outcome

The pressure threshold, identified from colorimetric measurements, for producing an 'acceptable' fresh meat colour at lab-scale was between 200–300 MPa. Pressures greater than 300 MPa resulted in striploin muscle that was lighter/paler and less red than untreated control samples but had minimal impact on texture and drip loss. Preliminary shelf life data from inoculated striploin samples pressure treated between 200–300 MPa showed that pressures of 250 and 300 MPa resulted in a significant reduction of TVC at 2 day storage compared to the control and 200 MPa samples.



Large-scale trials verified the pressure range for colour acceptability and consumer evaluation (visual assessment) identified 200 MPa treatment as the suitable threshold pressure for achieving a ‘close to fresh’ meat product (Figure 1). Microbiology counts remained low ($<7 \log_{10} \text{ cfu/cm}^2$) across 20 weeks when stored at -1°C . There was no difference in microbiology between treatments, however, HPP appeared to delay growth at week 4. Trained sensory panellists assessed pressure-treated samples as more tender, with a higher flavour and overall liking compared to control samples.

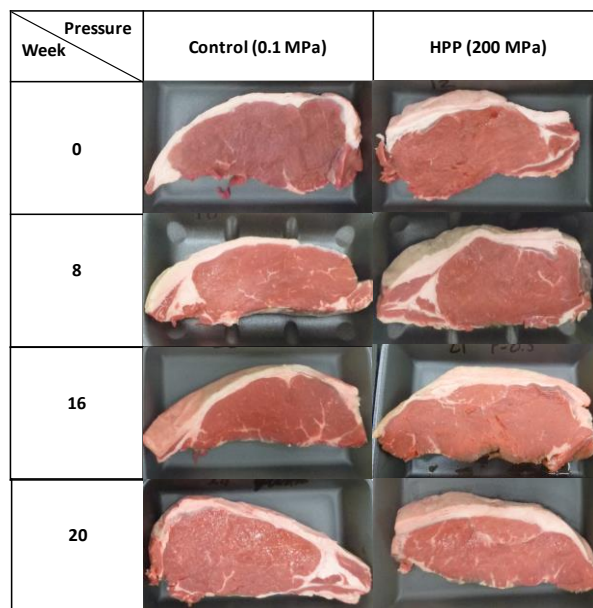


Figure 1: Representative photographs of control (untreated, 0.1 MPa) and treated (HPP at 200 MPa at ambient for 5 min) striploin samples stored at -0.5°C for up to 20 weeks.

Benefit for Industry

Although HPP is an established processing technology for the shelf life extension of ready-to-eat meat products, the results from this project indicate that the pressure threshold (200 MPa) required to maintain a ‘close to fresh’ meat appearance does not impact on the microbial populations to provide a beneficial extension of shelf life of fresh meat primals or sliced steak portions, over and above traditionally aged meat. These HPP conditions also had minimal impact on other meat quality attributes such as tenderness (measured objectively) and yield.

The increase in lightness of muscle that occurred at pressures of 250–300 MPa, combined with no change in redness or yellowness, indicates that non-pigment related changes contributed to the colour stability of the muscle. Therefore, this provides an opportunity to pursue the potential to use HPP as an intervention to improve the colour acceptability of dark-cutting meat.

Consumer assessment of samples showed that visually, consumers could not differentiate between control and pressure-treated samples at any storage point. Additionally, a trained sensory panel assessed pressure-treated samples as having improved eating quality – more tender, with better flavour and higher overall liking – compared to control samples. So, although these HPP conditions had no effect on shelf life or objective texture, the eating quality was improved. This data therefore provides preliminary evidence of consumer perceptions and the likely acceptance of HPP as a food processing technology and the potential success of a pressure-treated meat product in the market place.

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