

Beef chuck roast tenderization by Yoghurt acid whey marination: Process optimization, antioxidant activity and Shelf life study

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Objective

Recently, yogurt acid whey (AW) – the main by-product of strained yoghurt production – has been effectively valorized as a tenderizing agent for marinating meat products. Its high content in lactic acid and calcium may affect the texture of these products while its low pH-value may have potential antimicrobial properties resulting in extended shelf-life. The objective of this study was to optimize the beef meat (beef chuck roast) tenderness, using AW as tenderizing agent and to evaluate its effect on in vitro gastrointestinal digestion and potential shelf-life extension.

Methods

A fully kinetic study was performed in order to select the optimal marinating parameters of beef slices, such as AW concentration, meat/liquid ratio and treatment time. Optimization of marinating process was conducted via Response Surface Methodology based on the more pronounced beef tenderness achieved with AW use, after cooking (80 °C for 45 min). The effect of optimal marinating conditions on antioxidant activity after in vitro gastrointestinal digestion of samples was also evaluated. Microbial analysis, quality indices and sensory evaluation of raw and marinated beef slices were evaluated during refrigeration storage (4 °C). The shelf-life of raw and marinated beef slices was also determined.

Results

AW marination enhanced the beef tenderness at all the studied conditions. The optimal marinating conditions were: 12.5% AW, 1:1 meat/liquid ratio and 19 h treatment time, resulting in 93% decrease in beef firmness, without significantly affecting the quality and sensory characteristics of beef slices ($p < 0.05$). AW-marination of beef slices increased or maintained antioxidant activity during gastrointestinal transit. Total aerobic bacteria of beef meat were significantly reduced by marinating procedure. The shelf-life of marinated beef was extended by 25% (8 days) compared to the corresponding 6 days of raw sample at 4 °C.

Conclusions

The use of AW in the meat industry could have a dual benefit: i. act as a tenderizing agent with antimicrobial effects and ii. provide an effective way for AW valorization, leading to reduced risks related to its disposal.