

Impact of Fast Pyrolysis-Derived Liquid Smoke on the Physical, Sensory, and Shelf-Life Properties of Cheddar Cheese and Beef Sirloin Steak

Sanaz Ghoreishi

Waikato Institute of Technology (Wintec), Hamilton, New Zealand

Saeid Baroutian

Waikato Institute of Technology (Wintec), Hamilton, New Zealand

Abstract

Liquid smoke, produced by fast pyrolysis and selective condensation of *kanuka* wood, offers a promising alternative to traditional smoking methods by providing distinctive flavour, efficient processing, and extended shelf-life benefits. In this study, liquid smoke was applied to two food systems: beef sirloin steak and cheddar cheese. For steak, different liquid smoke concentrations and marination times were tested. Sensory descriptors were identified through focus group testing. Consumer evaluation using check-all-that-apply (CATA) and principal component analysis (PCA) indicated that steak marinated with 3% (w/w) liquid smoke for 30 minutes achieved the highest preference scores, with overall liking strongly correlated to odour and flavour attributes, the primary drivers of purchase intention. Chemical analysis confirmed that low liquid smoke concentrations did not significantly alter moisture, fat, or pH levels. For cheddar cheese, liquid smoking was compared with conventional cold smoking. Texture profile analysis, colour measurements, and shelf-life studies were conducted, with PCA used to interpret treatment effects. Results demonstrated that liquid smoking provided rapid processing advantages while effectively modifying cheese characteristics, with smoke–cheese interactions continuing to influence product quality during storage. Chemical profiling of the *kanuka* liquid smoke revealed abundant phenolic compounds, including guaiacol, syringol, creosol, and 4-ethylguaiacol, which contributed to both flavour and preservative effects. Overall, the findings highlight the potential of *kanuka*-derived liquid smoke as a versatile food processing technology to enhance sensory appeal, maintain quality, and extend shelf life across diverse food products.