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Classification of organic beef freshness using VNIR hyperspectral imaging

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Abstract

Consumer trust in the food industry is heavily reliant upon accurate labelling of meat products. As such, methods, which can verify whether meat is correctly labelled are of great value to producers, retailers, and consumers. This paper illustrates two approaches to classify between, fresh and frozen thawed, and in a novel manner matured and matured frozen-thawed, as well as fresh and matured beef using the 500-1010 nm waveband, captured using hyperspectral imaging, and CIELAB measurements. The results show successful classification based upon CIELAB between 1) fresh and frozen-thawed (CCR = 0.93), and 2) fresh and matured (CCR = 0.92). With successful classification between matured and matured frozen-thawed beef using the entire spectral range (CCR = 1.00). The performance of reduced spectral models is also investigated. Overall it was found that CIELAB co-ordinates can be used for successful classification for all comparisons except between matured and matured frozen-thawed. Biochemical and physical changes of the meat are thoroughly discussed for each condition.

Keywords: beef, chromaticity, classification, freezing, hyperspectral, maturation, quality, storage, support vector machines, SVM, VNIR

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