

Accepted Manuscript

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PII: S0260-8774(15)00391-X

DOI: [10.1016/j.jfoodeng.2015.09.001](https://doi.org/10.1016/j.jfoodeng.2015.09.001)

Reference: JFOE 8315

To appear in: *Journal of Food Engineering*

Received Date: 7 June 2015

Revised Date: 5 August 2015

Accepted Date: 3 September 2015

Please cite this article as: Naganathan, G.K., Cluff, K., Samal, A., Calkins, C.R., Jones, D.D., Meyer, G.E., Subbiah, J., Three Dimensional Chemometric Analyses of Hyperspectral Images for Beef Tenderness Forecasting, *Journal of Food Engineering* (2015), doi: 10.1016/j.jfoodeng.2015.09.001.

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Three Dimensional Chemometric Analyses of Hyperspectral Images for Beef Tenderness Forecasting

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Abstract

A prototype on-line hyperspectral imaging system ($\lambda = 400$ to 1000 nm) was developed and used to acquire images of exposed ribeye muscle on hanging beef carcasses ($n = 274$) at 2-day postmortem in a commercial beef packing plant. After image acquisition, a strip steak was cut from each carcass and vacuum packaged. After aging for 14 days, the steaks were cooked and Warner-Bratzler shear force values were collected as a measure of tenderness. Four different principal component analysis-based dimensionality reduction methods were implemented to reduce information redundancy in beef hyperspectral images. Textural features extracted from the 2-day hyperspectral images were modeled using Fisher's linear discriminant (FLD), support vector machines (SVM), and decision tree (DT) models to predict 14-day aged, cooked beef tenderness.

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