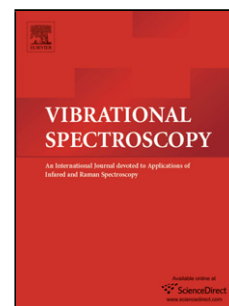


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# Raman Spectroscopy based Analysis of Milk using Random Forest Classification

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## Abstract

The development of a classification system based on the Raman spectra of milk samples is proposed in present study. Such development could be useful for nutritionists in suggesting healthy food to infants for their proper growth. Previously, molecular structures in milk samples have been exploited by Raman spectroscopy. In the current study, Raman spectral data of milk samples of different species is utilized for multi-class classification using a dimensionality reduction technique in combination with random forest (RF) classifier. Quantitative and experimental analysis is based on locally collected milk samples of different species including cow, buffalo, goat and human. This classification is based on the variations (different concentrations of the components present in milk such as proteins, milk fats, lactose etc.) in the intensities of Raman peaks of milk samples. Principal component analysis (PCA) is used as a dimensionality reduction technique in combination with RF to highlight the variations which can differentiate the Raman spectra of milk samples from different species. The proposed technique has demonstrated sufficient potential to be used for differentiation between milk samples of different species as the average accuracy of about 93.7%, precision of about 94%, specificity of about 97% and sensitivity of about 93% has been achieved.

**Keywords:** Raman spectroscopy; Milk; Principal component analysis; Random forest classifier.

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