

## Chia Oil Adulteration Detection Based on Spectroscopic Measurements

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### Abstract:

Chia oil is a valuable source of omega-3-fatty acids and other nutritional components. However, it is expensive to produce and can therefore be easily adulterated with cheaper oils to improve the profit margins. Spectroscopic methods are becoming more and more common in food fraud detection. The aim of this study was to answer following questions: Is it possible to detect chia oil adulteration by spectroscopic analysis of the oils? Is it possible to identify the adulteration oil? Is it possible to determine the amount of adulteration? Two chia oils from local markets were adulterated with three common food oils, including sunflower, rapeseed and corn oil. Subsequently, six chia oils obtained from different sites in Kenya were adulterated with sunflower oil to check the results. Raman, NIR and fluorescence spectroscopy were applied for the analysis. It was possible to detect the amount of adulterated oils by spectroscopic analysis, with a minimum  $R^2$  of 0.95 for the used partial least square regression with a maximum RMSEP range of 10%. The adulterations of chia oils by rapeseed, sunflower and corn oil were identified by classification with a median true positive rate of 90%. The training accuracies, sensitivity and specificity of the classifications were over 90%. Chia oil B was easier to detect. The adulterated samples were identified with a precision of 97%. All of the classification methods show good results, however SVM were the best. The identification of the adulteration oil was possible; less than 5% of the adulteration oils were difficult to detect. In summary, spectroscopic analysis of chia oils might be a useful tool to identify adulterations.