Combination of ^{1}H NMR and chemometrics to detect camellia oil adulteration

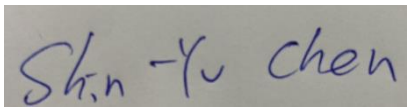
Rosie Nguyen (G11080054)[1], Shin-Yu Chen[2]

[1]International Master's Degree Program in Food Science,
National Pingtung University of Science and Technology, Taiwan, R. O. C.
[2]Department of Food Science,
National Pingtung University of Science and Technology, Taiwan, R. O. C.

Abstract

Edible oil is widely used, can be used for frying, stir-frying, salad dressing, or used in food product formulations, and it is also used to add flavor to dishes depending on their texture or special flavor. As one of the popular edible vegetable oils, camellia oil (CAO) is well known for its distinctive flavor and taste, high nutritional values, medical functions, and better storage stability than other edible oil. CAO not only contains a high concentration of unsaturated fatty acids, for instance, palmitoleic acid, oleic acid, linoleic acid, and linolenic acid. In addition to unsaturated fatty acids, it is also rich in vitamin E, squalane, and especially tea polyphenol. Due to its high nutritional values, CAO costs more expensive and becomes a target for adulterating with cheaper vegetable oils such as corn oil (CO), soybean oil (SO), rapeseed oil (RO), sesame oil (SEO), and rice bran oil (RBO) due to being apparently similar to commercially qualified CAO to seek high profit. In the study, proton nuclear magnetic resonance (^{1}H NMR) spectra combined with principal component analysis (PCA), orthogonal projection to latent structures discriminant analysis (OPLS-DA), and partial least squares (PLS) were proven to be useful for the authentication of CAO adulteration in qualitative and quantitive analysis. With the intensity of 15 selected ^{1}H NMR signals as input variables, PCA showed good group clustering results for pure CAO and adulteration CAO. On the other hand, the appropriate adulteration ratio of no less than 30% could be clearly discriminated by (OPLS-DA) models.

Keywords: Camellia oil (CAO), adulteration, NMR, PCA, OPLS-DA, PLS.



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