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Quality control of saffron and evaluation of potential adulteration by means of thin layer chromatography-image analysis and chemometrics methods

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1 **Quality control of saffron and evaluation of potential adulteration by means of thin layer**
2 **chromatography-image analysis and chemometrics methods**

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11
12 **Abstract**

13 Saffron (*Crocus sativus*) stigmas as a flavoring commodity command a very high price in
14 international food markets and, as a result, are a candidate for various kinds of fraud. This paper
15 reports on the use of thin layer chromatography combined with image analysis (TLC-IA) and
16 chemometrics techniques for validating the authenticity of saffron and rapidly identifying the
17 type of adulterants. This method includes several pre-processing steps, such as correcting the
18 general baseline (using the asymmetric least squares (AsLS) algorithm), converting the images
19 to RGB chromatographic channels, and removing the shifts and concavity of spots (using a
20 correlation optimization warping (COW) algorithm) prior to image analysis of saffron thin layer
21 chromatography patterns. After employing the preprocessing sequence, different unsupervised
22 multivariate data analysis (i.e. principal component analysis (PCA) and k-means) and supervised
23 chemometric methods (i.e. partial least squares discrimination analysis (PLS-DA), variable

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