

Classification of Pericarpium Citri Reticulatae of Different Ages by Using a Voltammetric Electronic Tongue System

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A portable voltammetric electronic tongue (VE-tongue) system was developed and used to classify pericarpium citri reticulatae (PCR), a traditional Chinese herbal medicine, on the basis of its age for authentication. An array of sensors with eight working electrodes (glass carbon, nickel, titanium, palladium, platinum, wolfram, gold and silver), a counter electrode and a reference electrode were used for signal collection. The feature data was further extracted from the raw signals by discrete wavelet transform (DWT). Seven linear and nonlinear classification methods, namely, principal component analysis (PCA), cluster analysis (CA), linear discriminant analysis (LDA), back-propagation neural network (BPNN), extreme learning machine (ELM), random forest (RF) and support vector machine (SVM), were compared for developing the discrimination model. The experimental results showed that the ELM model, in which the discrimination rates were 100% and 95% in the training and testing set, respectively, exhibited superior performance compared to the other models. The final results suggested that the VE-tongue system with the DWT-ELM classification method could be used to effectively identify PCR of various ages.

Keywords: Pericarpium Citri Reticulatae; Voltammetric electronic tongue; Discrete wavelet transform; Multivariate analysis

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