不同贮存温度蜂花粉的可见-近红外光谱鉴别 Application of Visible/Near Infrared Spectroscopy for Discrimination of Bee Pollen under Different Storage Temperature

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关键词： 可见-近红外光谱技术 蜂花粉 贮存温度 主成分分析 最小二乘支持向量机

摘 要： 利用可见-近红外光谱技术结合最小二乘支持向量机（LS-SVM）对不同贮存温度下的蜂花粉进行鉴别。选择-20、4、15、25和40℃ 5个温度下分别贮存60d后的蜂花粉为研究对象。对原始光谱数据进行平滑和附加散射校正（MSC）的预处理后进行主成分分析，选择4～20个主成分作为输入变量进行LS-SVM建模。模型预测参数比较结果显示，当主成分数取20时模型的预测效果最好，预测相关系数r2p≥0.9919，预测标准偏差（SEP）和预测均方根误差（RMSEP）分别为1.7854和1.7675，优于偏最小二乘回归（PLS）的预测结果，说明基于LS-SVM的可见-近红外光谱技术能够很好地对蜂花粉贮存温度进行检测。 In order to develop a fast and efficient method to determine the freshness of bee pollen, visible and near infrared (Vis/NIR) spectroscopy combined with least square support vector machine (LS-SVM) was applied to identify the samples of bee pollen under the different storage temperature. Five storage temperatures including -20, 4, 15, 25 and 40℃ were set. The Camellia pollens stored for 60 days at different set temperatures were investigated. Spectra were acquired by an ASD fieldspec spectrometer. As the pretreatments of the optimal smoothing way, moving average with three segments and multiplication scatter correction (MSC) were applied to reduce the noise of the spectra. After the principle component analysis of the spectra from 400 to 1000 nm, 4 to 20 principal components (PCs) were chosen as the inputs of LS-SVM models. Results show that the r2p of the LS-SVM model with 20 PCs was more than 0.9919 in validation set, and was better than the traditional PLS model. The results also indicated that the PCs could reflect and represent the main characteristics of bee pollens stored at different temperatures, and the LS-SVM model could be used to discriminate the samples of bee pollen under the different storage temperature.

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