

霉变板栗的近红外光谱和神经网络方法判别 Discrimination of Moldy Chinese Chestnut Based on Artificial Neural Network and Near Infrared Spectra

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关键词: 板栗 近红外光谱 BP神经网络 预处理 主成分提取

摘要: 利用近红外光谱检测了带壳板栗的品质。在波数为12000~4000cm⁻¹ 范围内采用近红外漫反射法采集了合格板栗和霉变板栗的光谱,用6种光谱预处理方法分析数据,比较了板栗近红外光谱在不同预处理方法下所建模型的识别率。试验结果表明经矢量归一化预处理所建模型识别效果最好,对预测集中的合格板栗、表面霉变板栗、内部霉变板栗的预测正确率分别为94.74%、94.44%、92.31%。The nondestructive discrimination of the shelled chestnuts was studied with near infrared spectra, which could provide a new method for quality detection of other shelled agricultural products. 178 chestnut samples were prepared and the diffuse spectral reflectance of the samples were collected in the wave number range of 12000~4000cm⁻¹. First, six preprocessing methods including smooth、vector normalization、min-max normalization、standard normal variate transformation、multiplication scattering correction and first derivative were used to improve the original spectrum. Then, principal component analysis was applied to compress thousands of spectral data into several variables and to collect spectral information. The principal components extracted by PCA were employed as the inputs of the BP neural networks. Effects of the six preprocessing methods on the models based on BP neural network were compared. The results show that prediction precision varied to different preprocessing methods. The optimum network structure of 7-4-1 was obtained after vector normalization method. Discriminating rate of qualified chestnut, surface moldy chestnut and internal moldy chestnut in prediction reached 94.74%, 94.44% and 92.31%, respectively.

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