

基于电子鼻系统的番茄苗不同种类损伤的区分效果研究

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摘要:

通过对早疫病病害番茄苗、灰霉病病害番茄苗、机械损伤番茄苗和对照番茄苗的电子鼻响应信号的对比, 可以看出不同处理的番茄苗样本电子鼻的响应信号是不同的, 其中对照处理样本的响应信号值最小, 其次是机械损伤的番茄苗样本, 早疫病病害损伤样本和灰霉病损伤样本的响应值较大。从PCA结果来看, 早疫病病害的番茄苗和灰霉病病害的番茄苗能很好区分开, 机械损伤的番茄苗和正常处理的番茄苗产生了重叠现象。从LDA结果可知, 四种处理番茄苗本能很好的区分, 机械损伤番茄苗样本与正常处理的番茄苗样本比较接近, 采用LDA的区分效果明显比PCA要好。利用BP神经网络和支持向量机两种识别模式对四种不同损伤番茄苗样本的预测结果, 对比预测结果, 两种模型都能对样本进行很好的区分。

关键词: 番茄苗; 不同损伤; 电子鼻

Discrimination of different types damage of tomato seedling by electronic nose

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Abstract:

The profiles of volatile compounds emitted by plants varies in response to different damage. The potential of electronic nose technology to monitor such changes, with the aim of diagnosing plant health was investigated. An electronic nose (E-nose) was used to analyse tomato seedlings that were subjected to different types of damage (infection by Early blight disease, infection by Gray mold disease, mechanically damage, and undamaged). Principal component analysis (PCA), linear discrimination analysis (LDA), back-propagation neural network (BPNN), and support vector machine (SVM) network were used to evaluate the E-nose data. The results indicated that the E-nose can successfully discriminate between tomato seedling with different types of damage. The results of PCA and LDA showed that clusters of data were divided into 3 groups (EP, GP, and CP/MP). Samples from groups CP and MP overlapped partially. Back-propagation neural network (BPNN) and support vector machine (SVM) network were used to evaluate the E-nose data. Good discrimination results were obtained using SVM and BPNN. The results demonstrate that it is plausible to use E-nose technology as a method for monitoring damage in tomato seedling.

Keywords: tomato seedling; different damage; electronic nose

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