2024年第3期 总416期

茶学研究专题

本期导读

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2. 探索筛选表面增强拉曼光谱特征峰的变量优化方法用于茶叶中苯醚甲环唑农药的快速检测
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2. 基于图像处理和机器学习技术的植物病害检测

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学术文献

1．Green preparation, safety control and intelligent processing of high-quality tea extract（优质茶提取物的绿色制备、安全控制和智能加工）

简介：Tea contains a variety of bioactive components, including catechins, amino acids, tea pigments, caffeine and tea polysaccharides, which exhibit multiple biological activities. These functional components in tea provide a variety of unique flavors, such as bitterness, astringency, sourness, sweetness and umami, which meet the demand of people for natural plant drinks with health benefits and pleasant flavor. Meanwhile, the traditional process of tea plantation, manufacturing and circulation are often accompanied by the safety problems of pesticide residue, heavy metal, organic solvents and other exogenous risks. High-quality tea extract refers to the special tea extract obtained by enriching the specific components of tea. Through green and efficient extraction technologies, diversed high-quality tea extracts such as high-fragrance and high-amino acid tea extracts, low-caffeine and high-catechin tea extracts, high-bioavailability and high-theaflavin tea extracts, high-antioxidant and high-tea polysaccharide tea extracts, high-umami-taste and low-bitter and astringent taste tea extracts are produced. Furthermore, rapid detection, green control and intelligent processing are applied to monitor the quality of tea in real-time, which guarantee the stability and safety of high-quality tea extracts with enhanced efficiency. These emerging technologies will realize the functionalization and specialization of high-quality tea extracts, and promote the sustainable development of tea industry.

来源：Critical Reviews in Food Science and Nutrition 期刊

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2．Exploring variables optimization methods to screen surface-enhanced Raman spectroscopy characteristic peaks for rapid detection of difenoconazole pesticides in tea（探索筛选表面增强拉曼光谱特征峰的变量优化方法用于茶叶中苯醚甲环唑农药的快速检测）

简介：Detection of pesticide residues in tea is a requisite technique to safeguard consumer food safety. This paper carried out rapid quantitative analysis of difenoconazole residues by surface-enhanced Raman spectroscopy (SERS) combined with chemometric methods. Primary secondary amine (PSA), nano bamboo charcoal (NBC) and anhydrous MgSO4 were employed to eliminate the impact of tea matrix in tea on the difenoconazole pesticides investigation. SERS spectral data excited with gold colloid was collected from 97 tea samples. Competitive adaptive reweighted sampling (CARS) was employed to choose some optimal spectral variables, which were coincident with experiment characteristic peaks and theoretical calculation. Then, random forest (RF) was adapted to develop quantitative analysis models for monitoring difenoconazole residues, and compared with partial least squares (PLS) models. The results demonstrated that the prediction performance of the models using spectra variables subset screened by CARS was significantly improved. In addition, non-linear RF regression models outperformed linear PLS regression models in predicting difenoconazole concentration in tea. The best results of the CARS_RF model were obtained with correlation coefficient (R), root mean square error (RMSE) and ratio performance

deviation (RPD) in prediction set of 0.97, 2.50 and 4.01, respectively. The overall results encouraged the development of a rapid, simple and convenient spectral spectroscopic quantitative analysis method of pesticide residues in tea.

来源：Vibrational Spectroscopy 期刊

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全文链接:http://agri.nais.net.cn/file1/M00/03/63/Csgk0WWc6YyAQZMoAC4c5ZgBjo0981.pdf

3．Identification of pesticide residues on black tea by fluorescence hyperspectral technology combined with machine learning（结合机器学习的荧光高光谱技术检测红茶中农药残留）

简介：Black tea has a long history in China, but in export trade, pesticide residues often exceed the standard. To obtain a rapid, accurate, and non-destructive identification method of pesticide residues on black tea, the fluorescence hyperspectral data of dry black tea sprayed with distilled water and six pesticides were collected in this study. The spectra were preprocessed by multiplicative scatter correction (MSC) and standard normal variate (SNV). Then the uninformative variable elimination (UVE), successive projections algorithm (SPA), competitive adaptive re-weighted sampling (CARS), UVE-SPA, and CARS-SPA were used to feature extraction. This study proposes a machine learning model composed of a one-dimensional convolutional neural network backbone (1D CNN backbone) and a random forest classifier (RF classifier) to identify pesticide residues on black tea, and the 1D CNN-RF model was compared with three other machine learning models (support vector machine, RF, and 1D CNN). The results show that MSC-CARS-SPA-1D CNN-RF is the best model for identifying pesticide residues on black tea in which the accuracy of the test set is 99.05%. Combined with fluorescence hyperspectral technology, the proposed 1D CNN-RF model has great potential in the non-destructive identification of pesticide residues on black tea.

来源：Food Science and Technology 期刊

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4．Simultaneous Determination and Health Risk Assessment of Four High Detection Rate Pesticide Residues in Pu'er Tea from Yunnan, China（云南普洱茶中4种高检出率农药残留的同时检测与健康风险评价）

简介：Four pesticides with a high detection rate in Pu'er tea have been determined by a QuEChERS (quick, easy, cheap, effective, rugged, safe) method with multiwalled carbon nanotubes (MWCNTs), and combined ultrahigh-performance liquid chromatographytriple quadrupole linear ion trap-tandem mass spectrometry (UHPLC-QTRAP-MS/MS). MWCNs have been compared with other common purification materials, and found to be superior. The matrix effect was systematically studied, and the results show that the MWCNs can quickly and effectively reduce matrix interference values, which were in the range from −17.8 to 13.8. The coefficients (R^2) were greater than 0.99, with the limit of quantification ranging from 0.1 to 0.5 μg/kg, and the recovery rate ranging from 74.8% to 105.0%, while the relative standard deviation (RSD) ranged from 3.9% to 6.6%. A total of 300 samples, taken from three areas in which Yunnan Pu'er tea was most commonly produced, tested for four pesticides.

The results show that the detection rate of tolfenpyrad in Pu'er tea was 35.7%, which is higher than other pesticides, and the lowest was indoxacarb, with 5.2%. The residual concentrations of chlorpyrifos, triazophos, tolfenpyrad and indoxacarb ranged from 1.10 to 5.28, 0.014 to 0.103, 1.02 to 51.8, and 1.07 to 4.89 mg/kg, respectively. By comparing with China's pesticide residue limits in tea (GB 2763-2021), the over standard rates of chlorpyrifos, tolfenpyrad, and indoxacarb were 4.35%, 0.87% and 0%, respectively. The risk assessment result obtained with the hazard quotient (HQ) method shows that the HQ of the four pesticides was far less than one, indicating that the risk is considered acceptable for the four pesticides in Pu'er tea. The largest HQ was found for tolfenpyrad, 0.0135, and the smallest was found for indoxacarb, 0.000757, but more attention should be paid to tolfenpyrad in daily diets in the future, because its detection rate, and residual and residual median were all relatively high.

来源：Molecules 期刊

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相关专利

1. INTELLIGENT CROP DISEASE DETECTION AND DIAGNOSIS SYSTEM USING MACHINE LEARNING ALGORITHMS（基于机器学习算法的智能化作物病害检测与诊断系统）

简介：公开了一种利用机器学习算法准确检测和诊断作物病害的创新系统和方法。该系统通过整合视觉图像、环境和专家知识等多个数据源，对作物病害进行高精度分析和分类。这种智能方法能够实现作物疾病的早期发现、快速诊断和有针对性的治疗，最终提高作物产量并促进可持续农业实践。该系统的主要特点包括数据集成、先进的机器学习算法、早期疾病检测、精确诊断、实时监测和警报、远程访问以及成本和时间效率。通过智能化作物病害检测和诊断系统，农民和农业专家可以有效地管理作物健康，优化干预措施，并确保农业生产的长期性和可持续性。

来源：印度专利

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全文链接:http://agri.nais.net.cn/file1/M00/10/36/Csgk0GWc-S6AIey_ABaUAEYHY18039.pdf

2. Detection of Plant-Disease by using Image-Processing and Machine Learning Technologies（基于图像处理和机器学习技术的植物病害检测）

简介：Detection of Plant-Disease by using Image-Processing and Machine Learning Technologies Abstract : Plants play a critical role in our lives. This plant is afflicted with a variety of diseases that affect nearly every part of it, from the roots and stems to the leaves and even the fruits. In the long run, it is critical to get a disease diagnosis correct because it saves both time and money. Monitoring plant diseases manually can be time consuming and ineffective. Agriculture accounts for 70% of India's total output. Due to the movement of nematodes and animals in fields, crop yields can be reduced by 20% to 40% each year. Crop growers must be able to detect and control disease outbreaks in their crops. Color, texture, and shape are just a few factors that can aid in determining the presence

of plant pathogens. Numerous individuals have developed image processing systems that incorporate a variety of techniques. Capturing and classifying plant diseases correctly using image-processing and ML techniques is critical for farming success. This study sparked research frenzy into the detection of plant disease using cutting-edge image processing and deep learning techniques.

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