2024年第1期 总414期

茶学研究专题

本期导读

学术文献

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相关专利

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2. 基于机器学习和深度卷积神经网络的植物叶片病害自动诊断

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学术文献

1. Challenges and applications of volatile organic compounds monitoring technology in plant disease diagnosis（挥发性有机物监测技术在植物病害诊断中的挑战与应用）

简介：Biotic and abiotic stresses are well known to increase the emission of volatile organic compounds (VOCs) from plants. The analysis of VOCs emissions from plants enables timely diagnostic of plant diseases, which is critical for prompting sustainable agriculture. Previous studies have predominantly focused on the utilization of commercially available devices, such as electronic noses, for diagnosing plant diseases. However, recent advancements in nanomaterials research have significantly contributed to the development of novel VOCs sensors featuring exceptional sensitivity and selectivity. This comprehensive review presents a systematic analysis of VOCs monitoring technologies for plant diseases diagnosis, providing insights into their distinct advantages and limitations. Special emphasis is placed on custom-made VOCs sensors, with detailed discussions on their design, working principles, and detection performance. It is noteworthy that the application of VOCs monitoring technologies in the diagnostic process of plant diseases is still in its emerging stage, and several critical challenges demand attention and improvement. Specifically, the identification of specific stress factors using a single VOC sensor remains a formidable task, while environmental factors like humidity can potentially interfere with sensor readings, leading to inaccuracies. Future advancements should primarily focus on addressing these challenges to enhance the overall efficacy and reliability of VOCs monitoring technologies in the field of plant disease diagnosis.

来源：Biosensors and Bioelectronics 期刊

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2. Fungal volatile organic compounds: mechanisms involved in their sensing and dynamic communication with plants（真菌挥发性有机化合物:与植物感应和动态通信的机制）

简介：Microbial volatile organic compounds (MVOCs) are mixtures of gas-phase hydrophobic carbon-based molecules produced by microorganisms such as bacteria and fungi. They can act as airborne signals sensed by plants being crucial players in triggering signaling cascades influencing their secondary metabolism, development, and growth. The role of fungal volatile organic compounds (FVOCs) from beneficial or detrimental species to influence the physiology and priming effect of plants has been well studied. However, the plants mechanisms to discern between FVOCs from friend or foe remains significantly understudied. Under this outlook, we present an overview of the VOCs produced by plant-associate fungal species, with a particular focus on the challenges faced in VOCs research: i) understanding how plants could perceive FVOCs, ii) investigating the differential responses of plants to VOCs from beneficial or detrimental fungal strains, and finally, iii) exploring practical aspects related to the collection of VOCs and their eco-friendly application in agriculture.

来源：Frontiers in Plant Science 期刊
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3．Polyphenols in Plants: Structure, Biosynthesis, Abiotic Stress Regulation, and Practical Applications（植物中的多酚：结构、生物合成、非生物胁迫调节和实际应用）

简介：Phenolic compounds or polyphenols are among the most common compounds of secondary metabolism in plants. Their biosynthesis is characteristic of all plant cells and is carried out with the participation of the shikimate and acetate-malonate pathways. In this case, polyphenols of various structures are formed, such as phenylpropanoids, flavonoids, and various oligomeric and polymeric compounds of phenolic nature. Their number already exceeds 10,000. The diversity of phenolics affects their biological activity and functional role. Most of their representatives are characterized by interaction with reactive oxygen species, which manifests itself not only in plants but also in the human body, where they enter through food chains. Having a high biological activity, phenolic compounds are successfully used as medicines and nutritional supplements for the health of the population. The accumulation and biosynthesis of polyphenols in plants depend on many factors, including physiological-biochemical, molecular-genetic, and environmental factors. In the review, we present the latest literature data on the structure of various classes of phenolic compounds, their antioxidant activity, and their biosynthesis, including their molecular genetic aspects (genes and transfactors). Since plants grow with significant environmental changes on the planet, their response to the action of abiotic factors (light, UV radiation, temperature, and heavy metals) at the level of accumulation and composition of these secondary metabolites, as well as their metabolic regulation, is considered. Information is given about plant polyphenols as important and necessary components of functional nutrition and pharmaceutically valuable substances for the health of the population. Proposals on promising areas of research and development in the field of plant polyphenols are presented.
来源：International Journal of Molecular Sciences 期刊
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4．Recent Advances in the Application of Metabolomics to Studies of Biogenic Volatile Organic Compounds (BVOC) Produced by Plant（代谢组学在植物生物源性挥发性有机化合物研究中的应用进展）

简介：In many plants, biogenic volatile organic compounds (BVOCs) are produced as specialized metabolites that contribute to the characteristics of each plant. The varieties and composition of BVOCs are chemically diverse by plant species and the circumstances in which the plants grow, and also influenced by herbivory damage and pathogen infection. Plant-produced BVOCs are receptive to many organisms, from microorganisms to human, as both airborne attractants and repellants. In addition, it is known that some BVOCs act as signals to prime a plant for the defense response in plant-to-plant communications. The compositional profiles of BVOCs can, thus, have

profound influences in the physiological and ecological aspects of living organisms. Apart from that, some of them are commercially valuable as aroma/flavor compounds for human. Metabolomic technologies have recently revealed new insights in biological systems through metabolic dynamics. Here, the recent advances in metabolomics technologies focusing on plant-produced BVOC analyses are overviewed. Their application markedly improves our knowledge of the role of BVOCs in chemosystematics, ecological influences, and aroma research, as well as being useful to prove the biosynthetic mechanisms of BVOCs.

来源： Metabolites 期刊

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相关专利

1. METHOD AND SYSTEM FOR DIAGNOSING PLANT DISEASE AND INSECT PEST（植物病虫害诊断方法及系统）

简介： A method and a system for diagnosing a plant disease and an insect pest are provided. The method includes : obtaining an plant image; determining a candidate specie and candidate disease and insect pest information corresponding to at least part of the candidate specie according to the plant image when a current diagnosis mode is a passive diagnosis mode; screening out the candidate disease and insect pest information of the candidate specie according to a first preset condition for the candidate specie with the corresponding candidate disease and insect pest information; and outputting at least part of remaining disease and insect pest information after screening out when there is the remaining disease and insect pest information.

来源： 美国专利

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2．AUTOMATIC PLANT LEAF DISEASE DIAGNOSIS WITH MACHINE LEARNING AND DEEP CONVOLUTIONAL NEURAL NETWORKS（基于机器学习和深度卷积神经网络的植物叶片病害自动诊断）

简介： 本发明公开了一种用于植物叶类疾病诊断的系统。接口模块(104)被配置为接收植物的图像(102)。可操作地耦合到所述接口模块(104)的数据增强模块(108)。训练和验证模块(110)被配置为对所述至少一个植物图像的所述视觉表示进行分类和排列。检测模块(112)包括被配置为接收图像(102)的排列的视觉表示的深度卷积神经网络(CNN)，其中所述网络由具有至少三个卷积层(114)的最大集合组成。整流线性单元激活函数被配置为应用于每个卷积层和完全连接层的输出，其中在每个卷积全连接层，以级联方式馈送到下一层的每个图像的分辨率改变，其中对于每个层，植物叶片图像中的疾病被突出显示。

来源： 澳大利亚专利

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