茶学研究专题

本期导读

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学术文献

1．Tea Tree Pest Detection Algorithm Based on Improved Yolov7-Tiny（基于改进Yolov7-Tiny的茶树害虫检测算法）

简介：Timely and accurate identification of tea tree pests is critical for effective tea tree pest control. We collected image data sets of eight common tea tree pests to accurately represent the true appearance of various aspects of tea tree pests. The dataset contains 782 images, each containing 1~5 different pest species randomly distributed. Based on this dataset, a tea garden pest detection and recognition model was designed using the Yolov7-tiny network target detection algorithm, which incorporates deformable convolution, the Biformer dynamic attention mechanism, a non-maximal suppression algorithm module, and a new implicit decoupling head. Ablation experiments were conducted to compare the performance of the models, and the new model achieved an average accuracy of 93.23%. To ensure the validity of the model, it was compared to seven common detection models, including Efficientdet, Faster Rcnn, Retinanet, DetNet, Yolov5s, YoloR, and Yolov6. Additionally, feature visualization of the images was performed. The results demonstrated that the Improved Yolov7-tiny model developed was able to better capture the characteristics of tea tree pests. The pest detection model proposed has promising application prospects and has the potential to reduce the time and economic cost of pest control in tea plantations.

来源：Agriculture-Basel 期刊

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全文链接：http://agri.nais.net.cn/file1/M00/03/5E/Csgk0YlFRtaAVb5SAGk9-hnV5uI432.pdf

2．Current status and prospect of entomopathogenic fungi for controlling insect and mite pests in tea plantations（昆虫病原真菌防治茶园昆虫和螨类害虫的现状与展望）

简介：Tea, *Camellia sinensis* (L) O. Kuntze, is the most popular non-alcohol beverage and has over a thousand years of cultivation history. Sustainable tea cultivation is hampered by insect and mite pests and heavily relies on conventional pesticides. However, such management strategies can cause environmental pollution and insect resistance. Well-planted tea ecosystem naturally provides a suitable micro-climatic condition for the prosperity of natural enemies, especially entomopathogenic fungi (EPF) that are susceptible to moisture, temperature and sunlight. Hence, EPF have been widely used in tea plantations for pest management. Here, we summarized the approaches of research pertaining to EPF diversity in ecosystems. We also describe the general infection process and discuss the environmental factors that impact EPF efficiency. Finally, we listed the successful cases of EPF in tea pest management. Overall, this review has provided the application status and biological potential of EPF, which will contribute to agricultural productivity, and ecological, economic and social sustainability in the tea ecosystem.

来源：Journal of Applied Entomology 期刊

发布日期：2022-09-24

全文链接：http://agri.nais.net.cn/file1/M00/10/30/Csgk0GTujj6Af5GzACPjCWLdRVM504.pdf

3．**Mathematical Model of Pest Control Using Different Release Rates of Sterile Insects and Natural Enemies**（利用不育昆虫和天敌不同释放率防治病虫害的数学模型）

简介：In the framework of integrated pest management, biological control through the use of living organisms plays important roles in suppressing pest populations. In this paper, the complex interaction between plants and pest insects is examined under the intervention of natural enemies releases coupled with sterile insects technique. A set of nonlinear ordinary differential equations is developed in terms of optimal control model considering characteristics of populations involved. Optimal control measures are sought in such a way they minimize the pest density simultaneously with the control efforts. Three different strategies relating to the release rate of sterile insects and predators as natural enemies, namely, constant, proportional, and saturating proportional release rates, are examined for the attainability of control objective. The necessary optimality conditions of the control problem are derived by using Pontryagin maximum principle, and the forward-backward sweep method is then implemented to numerically calculate the optimal solution. It is shown that, in an environment consisting of rice plants and brown planthoppers as pests, the releases of sterile planthoppers and ladybeetles as natural enemies can deteriorate the pest density and thus increase the plant biomass. The release of sterile insects with proportional rate and the release of natural enemies with constant rate are found to be the most cost-effective strategy in controlling pest insects. This strategy successfully decreases the pest population about 35 percent, and thus increases the plant density by 13 percent during control implementation.

来源：Mathematics 期刊

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全文链接：http://agri.nais.net.cn/file1/M00/10/30/Csgk0GTu6dGAL4OtABicvZNRa08753.pdf

4．**Ecological Risk Assessment of Soil Heavy Metals and Pesticide Residues in Tea Plantations**（茶园土壤重金属和农药残留生态风险评价）

简介：Tea plantations have used many synthetic chemicals to ensure performance and control of pests. This has led to increased contamination of soils and reduced tea growth. We assessed the levels of heavy metals, including Cd, Cr, Pb, Cu, Ni, Zn, Hg, As, and pesticide residues, such as HCHs, biphenyl chrysanthemum ester, methamidophos, imidacloprid, permethrin, in the soil of tea plantations of Taiwan, Tibet, Guangdong, and Fujian. The Potential Ecological Risk Index and the Nemerow comprehensive pollution index were used to analyze the data. The results showed that risk indices in Tibet, Guangdong and Fuzhou were considered as moderate ecological harm level. Ecological risk assessment index of Anxi organic and Anxi conventional tea gardens suggested a "low" risk level. The Nemerow comprehensive pollution indices for soil pesticide residues in the tea plantations of Taiwan, Tibet, Anxi organic and Anxi conventional were considered mild. Guangdong and Fuzhou had values suggesting "slight pollution" levels. According to National Soil Environmental Quality Standard (GB15618-1995), soil in tea

plantations in Taiwan, Tibet, and Anxi conventional matched the national first grade of soil quality and those from Guangdong, Fuzhou, and Anxi organic tea garden matched the national second grade.

来源：Agriculture-Basel 期刊

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全文链接：http://agri.nais.net.cn/file1/M00/10/2F/Csgk0GTtuJOAP9uCAAfY-xeDIlk018.pdf

相关专利

1．Pesticide residue high-sensitivity and rapid test method by probe based on imprinted mofs（一种基于印迹mofs探针的农药残留高灵敏快速检测方法）

简介：一种基于印迹MOFs的探针检测农药残留的高灵敏度快速方法。首先，构建了基于MOFs的仿生酶探针的比色测试条，使用基于分子印迹MOF的仿生酶作为比色探针，对底物进行催化和氧化，使系统的颜色发生变化；采用低成本滤纸作为比色探针装载底座，并分为质量控制区（a）、标准区（B）和测试区（C），其中质量控制区域（a）可根据待测环境的温度、湿度、照度等选择最佳的比色分析参数；标准区域（B）用于通过滴加不同浓度的标准物质来获得标准比色区，并用于建立比色分析数学模型；测试区域（C）用于测试实际样品。利用比色试纸初步确定待测样品中农药残留的浓度范围；通过反应系统的颜色信号进一步计算所述样品的灰度值，建立比色分析模型，实现对多个复杂基质样品中微量农药残留的灵敏、准确、实时定量分析。

来源：世界知识产权组织

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2．Pesticide composition for controlling *Spodoptera frugiperda*（防治草地贪夜蛾的农药组成）

简介：Disclosed is a pesticide composition for controlling *Spodoptera frugiperda*. The pesticide includes an auxiliary material, an active ingredient A and an active ingredient B. The active ingredient A is tea saponin, the active ingredient B is chlorantraniliprole or tolfenpyrad, and the mass ratio of the active ingredient A to the active ingredient B is 1-20 : 20-1. In the present invention, by mixing tea saponin with chlorantraniliprole or tolfenpyrad, a pesticide with certain ratio is prepared to control *Spodoptera frugiperda*, has the advantages of good effect and low dosage, and can delay the resistance of *Spodoptera frugiperda* to pesticides.

来源：美国专利

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