

A Review on AI Techniques for Identifying Pest-Related Diseases in Coconut Leaves

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Abstract

Coconut farming faces significant threats from pest-related diseases, which are challenging to identify and manage manually due to the height of trees and the intricate structure of their leaves. Traditional inspection methods, achieving accuracy rates of about 60-80%, are labor-intensive and often unreliable. This systematic review investigates the application of Artificial Intelligence (AI), particularly Convolutional Neural Networks (CNNs), to enhance pest detection in coconut leaves. Following PRISMA guidelines, this study analyzed 50 research articles published between 2010 and 2024, sourced from ResearchGate and ScienceDirect. Among these, 22 studies focused on symptoms such as leaflet damage, caterpillar infestations, yellowing, drying, and flaccidity. EfficientNetB7 was identified as a top-performing model, achieving an accuracy 93.72%, thereby demonstrating substantial improvements in detection accuracy and potential for real-world applications. Conversely, ResNet50 and VGG16 exhibited limited effectiveness compared to more advanced architectures. Key Challenges include misclassification due to symptom overlap, limited dataset diversity, and environmental variability. This review emphasizes the importance of explainable AI, domain adaptation, and scalable models to enhance pest detection systems. Future research should focus on developing real-time diagnostic tools and integrating AI-driven approaches into sustainable pest management practices to improve efficiency and optimize resource utilization.

Keywords: *Coconut leaf disease classification, Artificial Intelligence, Machine Learning, Deep Learning, Image Processing*