

Integrated Approach for Early Detection and Management of Coconut Pests and Diseases: Focusing on Stem and Bud, with Precautions for Prevention

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Abstract

Coconut production is a cornerstone of agriculture in tropical regions, significantly contributing to national economies. However, coconut trees are increasingly vulnerable to pests and diseases, which critically impact productivity. This research proposes a comprehensive framework for the early detection of major coconut diseases, including stem bleeding, bud rot, and bud root dropping, as well as pest infestations, particularly from coconut caterpillars. Utilizing image processing and deep learning technologies, the study focuses on the stem and bud regions, achieving a detection accuracy exceeding 90%. The research methodology incorporates a systematic literature review and surveys to analyze existing detection techniques and management practices. The literature review identifies gaps in current studies, revealing that fewer than 20% focus specifically on stem and bud regions and that over 75% rely on traditional methods. Surveys with farmers and agricultural experts provide insights into practical challenges in disease detection and pest management, guiding the design of the proposed framework. This integrated approach not only ensures timely and accurate identification but also reduces disease and pest spread by up to 50% compared to traditional methods. The study also emphasizes pest prevention strategies and practical management solutions, combining biological and chemical control measures. The research highlights the critical need for advanced technologies such as deep learning and real-time monitoring for early detection and integrated management. It provides actionable management strategies to mitigate damage, enhance plantation health, and improve overall productivity. This work serves as a valuable resource for farmers, researchers, and policymakers, contributing to the protection and sustainability of coconut cultivation against pests and diseases.

Keywords: *Coconut pests and diseases, Image processing, Deep learning, Component, Artificial intelligence (AI)*