

Title: Advancements in Jute Leaf Disease Detection: A Comprehensive Study Utilizing Machine Learning and Deep Learning Techniques

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Abstract: Detecting diseases in jute leaves is difficult due to the variability in how the diseases appear. Manually identifying these diseases is challenging because it requires expert knowledge and visual inspections take a lot of time. Machine Learning (ML) offers a promising solution to these challenges by automating the detection process. However, research in this area is limited due to the lack of specific datasets. This study aims to address this by creating a comprehensive dataset of 10,800 high-quality images of jute leaf diseases. The main goal is to develop a robust system for classifying jute leaves into three categories: Yellow Mosaic, Powdery Mildew, and Healthy. Our methodology involved extensive image preprocessing, including resizing and various augmentation techniques, to enhance the dataset's diversity and ensure model robustness. We trained various ML and Deep Learning (DL) models and conducted a comparative analysis of their performance. Additionally, we compared our approach with the state-of-the-art methods. The results showed that DL models, particularly Inception V3, achieved an outstanding accuracy of 99.98%, compared to 89.75% for Random Forest (RF). This highlights the potential of DL techniques in improving the accuracy of jute leaf disease detection. Our findings contribute to better disease management strategies and increased productivity in jute cultivation.

Keywords: Sustainable agriculture, machine learning, crop management, leaf disease, plant pathology

https://www.researchgate.net/publication/387423729_Advancements_in_Jute_Leaf_Disease_Detection_A_Comprehensive_Study_Utilizing_Machine_Learning_and_Deep_Learning_Techniques