Plant stem disease detection using machine learning approaches

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ABSTRACT
The rapid identification of plant stem diseases is crucial for implementing timely intervention and minimizing crop loss. While previous research has primarily focused on leaf-based disease detection, this paper proposes an automated stem disease detection and classification model using digital image processing and machine learning techniques. A dataset comprising 3789 images of diseased and healthy stems, categorized into five classes (stem rot, gummy blight, blackleg, didymella, and healthy), was split into training (80%) and testing (20%) sets. Our experiments were conducted on multiple platforms, including Google Colab, Jupyter Notebook, and OpenCV, and compared the performance of four classification techniques: Support Vector Machine (SVM), Random Forest, K-Nearest Neighbor (KNN), and Impact Learning. Various performance metrics, such as accuracy, precision, recall, and F1 score, were employed to evaluate the classifiers. Our findings reveal that SVM outperformed the other classifiers, achieving an average accuracy of 87%, followed by Random Forest (79%), KNN (75%), and Impact Learning (70%). This research offers valuable insights for farmers and the agricultural industry, paving the way for future studies exploring disease detection in other plant parts using similar techniques.

KEYWORDS
Plant stem diseases; Disease detection; Digital image processing; Machine learning; Support vector machine; Random forest; K-Nearest neighbor; Impact Learning; Classification techniques; Accuracy; Precision; Recall; F1 score; Agricultural applications

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