

IDENTIFIKASI PENYAKIT PADA TANAMAN PISANG BERDASARKAN CITRA MENGGUNAKAN METODE *LEARNING VECTOR QUANTIZATION*

ABSTRAK

Tanaman pisang (*Musa acuminata*) merupakan salah satu komoditas hortikultura unggulan Indonesia dengan nilai ekonomi tinggi. Namun, produktivitasnya sering menurun akibat penyakit daun seperti *Panama Disease (Layu Fusarium)*, *Moko Disease (Layu Bakteri)*, *Black Sigatoka*, dan *Yellow Sigatoka*. Deteksi dini terhadap penyakit penting untuk mencegah kerugian ekonomi lebih besar. Penelitian ini bertujuan membangun sistem identifikasi penyakit pada tanaman pisang berbasis citra digital menggunakan metode *Learning Vector Quantization (LVQ)*. Data yang digunakan terdiri dari 1.250 citra daun pisang yang terbagi dalam lima kelas: empat kelas penyakit dan satu kelas daun sehat. Dataset diperoleh dari pengambilan gambar langsung dan sumber terbuka (*Kaggle*). Metodologi meliputi *preprocessing* citra (*resize* dan normalisasi), ekstraksi fitur warna (RGB) dan tekstur (GLCM), serta pelatihan model LVQ. Fitur RGB yang digunakan adalah nilai *mean* dan *standar deviasi*, sementara fitur GLCM mencakup *contrast*, *energy*, *entropy*, dan *homogeneity*. Data dibagi menjadi data latih dan uji dengan proporsi 80:20. Model LVQ dilatih untuk mengenali pola visual daun pisang dan mengklasifikasikannya ke kelas yang sesuai. Hasil pengujian menunjukkan bahwa model LVQ mampu mengidentifikasi penyakit dengan akurasi 82,4% pada data uji. Evaluasi menggunakan *confusion matrix*, *precision*, *recall*, dan *F1-score* untuk mengukur performa klasifikasi. Sistem juga diimplementasikan dalam bentuk web untuk memudahkan pengguna mengunggah citra dan memperoleh hasil prediksi secara langsung. Sistem ini diharapkan menjadi alat bantu efektif bagi petani dan penyuluh pertanian dalam mendeteksi penyakit daun pisang secara cepat, akurat, dan efisien.

Kata Kunci: Tanaman Pisang, Citra Digital, Penyakit Daun, Ekstraksi Fitur, *Learning Vector Quantization (LVQ)*

DISEASE IDENTIFICATION IN BANANA PLANTS BASED ON IMAGES USING THE LEARNING VECTOR QUANTIZATION METHOD

ABSTRACT

Banana (Musa acuminata) is one of Indonesia's leading horticultural commodities with high economic value. However, its productivity often declines due to leaf diseases such as Panama Disease (Fusarium Wilt), Moko Disease (Bacterial Wilt), Black Sigatoka, and Yellow Sigatoka. Early detection of these diseases is crucial to prevent greater economic losses. This study aims to develop a banana leaf disease identification system based on digital images using the Learning Vector Quantization (LVQ) method. The dataset consists of 1,250 banana leaf images divided into five classes: four disease classes and one healthy class. The dataset was obtained from direct image collection and open sources (Kaggle). The methodology includes image preprocessing (resizing and normalization), feature extraction of color (RGB) and texture (GLCM), and LVQ model training. RGB features used include mean and standard deviation values, while GLCM features consist of contrast, energy, entropy, and homogeneity. The data were split into training and testing sets in an 80:20 ratio. The LVQ model was trained to recognize visual patterns in banana leaves and classify them into the appropriate category. Testing results showed that the LVQ model achieved an accuracy of 82,4% on the testing data. Evaluation was conducted using a confusion matrix, precision, recall, and F1-score to measure classification performance. A web-based system was also developed to allow users to upload images and receive prediction results directly. This system is expected to be an effective tool for farmers and agricultural extension workers in identifying banana leaf diseases quickly, accurately, and efficiently.

Keywords: *Banana Plant, Digital Image, Leaf Disease, Feature Extraction, Learning Vector Quantization (LVQ)*