ABSTRACT

Melon is a high-value horticultural commodity whose productivity is often disrupted by diseases, pests, and the imbalanced use of fertilizers and pesticides. Early symptoms of such disturbances typically appear on leaves, manifesting as discoloration, structural damage, or morphological deformation. The manual identification of these symptoms by farmers remains limited in terms of accuracy, time efficiency, and susceptibility to subjective judgment. This study aimed to develop an image-based leaf disease classification system for melon plants using the Convolutional Neural Network (CNN) method to automate the identification process in a more efficient and accurate manner. The CNN model was constructed and evaluated through several experimental scenarios by comparing the data distribution methods, augmentation techniques (ImageDataGenerator, OpenCV, and their combination), and architectural configurations (two to four convolutional blocks). The dataset consisted of four classes: Healthy Leaf, Gemini, Liriomyza, and Pesticide Overdose, comprising a total of 3,200 augmented images. The best performance was achieved using a balanced dataset with augmentation via ImageDataGenerator and CNN architecture incorporating four convolutional blocks and two fully connected layers. This configuration yielded a validation accuracy of 96% and average precision, recall, and F1-score values of 0.95 for all classes. The trained model was subsequently deployed into a web-based application using the Flask framework, thereby enabling real-time disease detection by farmers. The results demonstrate that CNN is an effective solution for supporting the automated monitoring of melon plant health and holds significant potential for advancing precision agriculture practices.

Keywords: *Disease Identification, Melon Plants, Leaf Image, Convolutional Neural Network, Web-Based System*