

ABSTRAK

Mangga merupakan salah satu buah tropis yang banyak dibudidayakan dan dikonsumsi masyarakat Indonesia. Dalam distribusinya, mangga dapat mengalami proses pematangan secara alami di pohon atau dipercepat menggunakan bahan kimia seperti kalsium karbida (karbit). Pemakaian karbit dapat memberikan dampak negatif bagi kesehatan konsumen dan menurunkan kualitas nutrisi buah. Permasalahan muncul karena secara visual, perbedaan antara mangga alami dan karbit sulit dibedakan oleh masyarakat awam. Oleh karena itu, diperlukan suatu sistem klasifikasi berbasis citra digital untuk membedakan jenis kematangan mangga.

Penelitian ini mengembangkan sistem klasifikasi citra kematangan mangga alami dan karbit menggunakan metode *Gray Level Co-Occurrence Matrix* (GLCM) untuk ekstraksi fitur tekstur dan *K-Nearest Neighbor* (KNN) sebagai algoritma klasifikasi. Dataset yang digunakan berasal dari website Kaggle dengan total 618 data citra, masing-masing 309 citra mangga alami dan 309 citra karbit berformat .png berukuran 512×512 piksel. Proses penelitian meliputi tahapan pre-processing data (*resize* dan *remove background*), ekstraksi fitur tekstur menggunakan GLCM (dengan parameter *Angular Second Moment* (ASM), *energy*, *contrast*, *homogeneity*, *correlation*, dan *dissimilarity*), klasifikasi menggunakan algoritma KNN, serta evaluasi performa menggunakan *confusion matrix*.

Hasil penelitian menunjukkan bahwa metode GLCM efektif dalam mengekstraksi karakteristik tekstur citra mangga, sedangkan algoritma KNN dengan nilai $K=4$ memberikan hasil klasifikasi terbaik. Sistem klasifikasi ini mampu mencapai nilai akurasi sebesar 98% dengan nilai *precision*, *recall*, dan *F1-score* yang seimbang. Sistem ini diharapkan dapat menjadi solusi praktis dalam membantu konsumen maupun pelaku usaha buah untuk membedakan mangga matang alami dan karbit secara cepat dan akurat.

Kata Kunci: Klasifikasi Citra, GLCM, KNN, Mangga Alami, Mangga Karbit.

ABSTRACT

Mango is one of the tropical fruits widely cultivated and consumed by the Indonesian people. In its distribution, mangoes can undergo a natural ripening process on the tree or be accelerated using chemical agents such as calcium carbide (karbit). The use of karbit can have negative impacts on consumer health and reduce the nutritional quality of the fruit. The problem arises because, visually, the difference between naturally ripened and carbide-ripened mangoes is difficult for the general public to distinguish. Therefore, a digital image-based classification system is needed to differentiate the types of mango ripeness.

This study developed a classification system for distinguishing naturally ripened and carbide-ripened mango images using the Gray Level Co-Occurrence Matrix (GLCM) method for texture feature extraction and the K-Nearest Neighbor (KNN) algorithm for classification. The dataset used was obtained from the Kaggle website, consisting of a total of 618 image data, including 309 naturally ripened and 309 carbide-ripened mango images, in .png format with a size of 512×512 pixels. The research process included data pre-processing stages (resizing and background removal), texture feature extraction using GLCM (with parameters Angular Second Moment (ASM), energy, contrast, homogeneity, correlation, and dissimilarity), classification using the KNN algorithm, and performance evaluation using a confusion matrix.

The results of the study showed that the GLCM method was effective in extracting texture characteristics from mango images, while the KNN algorithm with K=4 produced the best classification results. This classification system achieved an accuracy rate of 98%, with balanced values for precision, recall, and F1-score. This system is expected to serve as a practical solution to help consumers and fruit traders quickly and accurately distinguish between naturally ripened and carbide-ripened mangoes.

Keywords: *Image Classification, GLCM, KNN, Natural Mango, Carbide Mango.*