

## INTISARI

### IDENTIFIKASI OTOMATIS VARIETAS KRATOM (*MITRAGYNA SPECIOSA*) KALIMANTAN TIMUR MELALUI CITRA DAUN DIGITAL DENGAN PENDEKATAN DEEP LEARNING CNN

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Identifikasi varietas kratom (*Mitragyna speciosa*) berbasis citra daun masih menghadapi kendala akibat kemiripan morfologi antarvarietas serta pengaruh latar belakang dan pencahayaan yang beragam pada citra lapangan. Kondisi tersebut dapat memengaruhi kestabilan dan akurasi proses klasifikasi. Penelitian ini bertujuan untuk meningkatkan kinerja klasifikasi varietas kratom melalui penerapan segmentasi Modified C-GrabCut (MCGC) sebelum proses klasifikasi berbasis deep learning. Citra daun dikumpulkan langsung dari lingkungan alami dan diproses melalui tahapan preprocessing, kemudian diklasifikasikan menggunakan Convolutional Neural Network (CNN) sebagai model utama. Sebagai pembanding digunakan MobileNetV2, VGG-16, serta metode klasik Support Vector Machine dan Random Forest. Evaluasi dilakukan pada tiga varietas kratom, yaitu vein hijau, vein merah, dan vein putih, menggunakan metrik akurasi, presisi, recall, dan F1-score. Hasil pengujian menunjukkan bahwa model CNN dengan segmentasi MCGC mencapai akurasi sebesar 94,67%, sedangkan MobileNetV2 memperoleh akurasi tertinggi sebesar 98,67%. Metode berbasis fitur manual menunjukkan performa yang lebih rendah dibandingkan pendekatan deep learning. Visualisasi Grad-CAM menunjukkan bahwa model memfokuskan perhatian pada struktur venasi dan kontur daun sebagai ciri morfologis utama. Hasil penelitian ini menunjukkan bahwa penerapan segmentasi yang sesuai berkontribusi terhadap peningkatan kestabilan dan keandalan proses klasifikasi varietas kratom berbasis citra daun pada kondisi lapangan.

**Kata kunci:** kratom, klasifikasi daun, CNN, deep learning, segmentasi citra

## ABSTRACT

### AUTOMATIC IDENTIFICATION OF KRATOM (*MITRAGYNA SPECIOSA*) VARIETIES FROM EAST KALIMANTAN USING DIGITAL LEAF IMAGES WITH A DEEP LEARNING CNN APPROACH

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The identification of kratom (*Mitragyna speciosa*) varieties based on leaf images continues to face challenges due to morphological similarities among varieties and variations in background and lighting conditions in field-acquired images. These factors can affect the stability and accuracy of classification performance. This study aims to improve the performance of kratom variety classification through the application of Modified C-GrabCut (MCGC) segmentation prior to deep learning-based classification. Leaf images were collected directly from natural environments and processed through preprocessing stages before being classified using a Convolutional Neural Network (CNN) as the main model. For comparison, MobileNetV2 and VGG-16 were employed as transfer learning-based models, while Support Vector Machine and Random Forest were used as classical baseline methods. Evaluation was conducted on three kratom varieties, namely Vein Hijau, Vein Merah, and Vein Putih, using accuracy, precision, recall, and F1-score metrics. The experimental results show that the CNN model combined with MCGC segmentation achieved an accuracy of 94.67%, while MobileNetV2 obtained the highest accuracy of 98.67%. Classical feature-based methods achieved lower performance compared to deep learning approaches. Grad-CAM visualization indicates that the models tend to focus on venation structures and leaf contours as key morphological features. These results suggest that the application of appropriate segmentation contributes to improving the stability and reliability of kratom variety classification based on leaf images under real-world conditions.

**Keywords: kratom, leaf classification, deep learning, CNN, image segmentation.**