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Morphological and Genetic Characterisation of Malaysian Durian (*Durio zibethinus*) Cultivar

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Structured Abstract

Background: Durian *(Durio zibethinus*) is a high-value tropical fruit crop that plays a significant economic role in Malaysia, with nearly 200 cultivars officially registered. Accurate cultivar authentication is essential to support commercial trade, breeding programmes, and the conservation of genetic resources. However, conventional identification methods based solely on morphological characteristics—such as fruit shape, thorn density, pulp colour, and leaf traits—are often unreliable due to environmental influences, phenotypic plasticity, and morphological overlap among closely related cultivars. These limitations increase the risk of mislabelling, particularly for premium cultivars, highlighting the need for more reliable and robust identification approaches.

Methods: This study was conducted using an integrated approach that combined morphological assessment and molecular identification based on DNA barcoding. Selected durian cultivars were evaluated according to their corresponding morphological traits, followed by genomic DNA extraction using a modified cetyltrimethylammonium bromide (CTAB) method. The chloroplast rbcL gene was amplified by polymerase chain reaction (PCR), and amplicon sizes were confirmed by agarose gel electrophoresis. Successfully amplified products were subsequently sequenced and analysed using sequence alignment and phylogenetic tree reconstruction to elucidate genetic relationships among the selected cultivars.

Results: Morphological analysis revealed a high degree of similarity among several selected cultivars, indicating that phenotypic characteristics alone are insufficient for accurate cultivar discrimination. In contrast, amplification of the rbcL barcode region was successful across all cultivars and effectively resolved genetic relationships at the species level. However, sequence variation within the rbcL gene was limited, resulting in reduced discriminatory power at the cultivar level. In addition, PCR band quality was influenced by leaf tissue age, with younger leaf samples yielding higher-quality DNA using the applied extraction method.

Conclusion: The findings of this study demonstrate that morphological identification alone is inadequate for reliable differentiation of durian cultivars. While the rbcL barcode region is suitable for species-level identification, its discriminatory power at the cultivar level is limited. Therefore, integrating morphological and molecular approaches can substantially enhance identification reliability.

Keywords: Durian cultivar, morphological identification, *rbcL* biomarker

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