

RAPID DETECTION AND MOLECULAR AUTHENTICATION OF SANDALWOOD MARKET SAMPLES USING HIGH-RESOLUTION MELTING ANALYSIS

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Sandalwood (*Santalum album* L.) is a highly valuable plant species known for its aromatic fragrance and medicinal properties. The fragrant heartwood of sandalwood is marketed for more than USD 100 Kg⁻¹, which is a relatively high price due to the rarity and limited availability of high-quality sandalwood in the market. The scarcity of sandalwood has led to its adulteration with several similar-scented or visually similar plant materials during the trade. This adulteration endangers the health of Sri Lankans, particularly when sandalwood products are used as herbal drugs. Detecting adulteration or contamination of processed sandalwood in the market using traditional morphological or chemical methods is challenging. DNA barcoding coupled with High-Resolution Melting (Bar-HRM) for adulterant detection is a novel method that provides promising ways of standardization. Due to the low DNA content preserved within the heartwood of sandalwood, DNA isolation from sandalwood samples is exceptionally challenging. The DNA isolated using a newly developed, modified CTAB protocol met the quality standards required for conducting High-Resolution Melting (HRM) analysis. The developed DNA barcodes for sandalwood and its potential adulterants using the *rbcL* universal primers and simulations of melting profiles using the 'uMELT' software produced differentiated melting curves, which affirmed the success of the developed barcodes. To assess the effectiveness of HRM in distinguishing pure sandalwood from adulterated samples, three frequently available sandalwood market samples, including suspected adulterated ones and authentic sandalwood samples, were subjected to HRM analysis. The normalized melting profiles and the Principal Component Analysis demonstrated the ability of HRM to identify adulteration by the variations in DNA melting curves, precisely showing the genetic dissimilarities to the reference authentic sandalwood sample. This research provides a valuable molecular tool for quality control and authentication of sandalwood in the market, offering a more reliable and efficient approach to adulterant detection.

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