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Distribution of carotenoids and vitamin A activity in aerial organs of selected underutilized Malaysian "ulam" or traditional vegetables (Averrhoa carambola, Manihot esculenta and Ipomoea batatas)

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Abstract

Purpose The purpose of this study is to evaluate the pattern of carotenoids distribution in three underutilized Malaysian 'ulam' or traditional vegetables in Malaysia (Averrhoa carambola, Manihot esculenta and Ipomoea batatas) and their valuable pro-vitamin A activities. These assessments will yield valuable knowledge and insight into the importance of these underutilized traditional vegetables and highlight their potential for applications in medicinal and functional colorant industries. Design/methodology/approach In this study, the authors have evaluated the distribution of carotenoid compounds in aerial organs of three underutilized traditional vegetables (Averrhoa carambola, Manihot esculenta and Ipomoea batatas). The content of the individual carotenoids were quantified using high-performance liquid chromatography (HPLC) and the organ with the highest accumulation of these compounds were identified. Their valuable pro-vitamin A activities were also reported to indicate their medicinal potential which can further be exploited as pharmacologically active natural colorants and in other applications. Findings In total, three major chromatographic peaks corresponding to lutein, violaxanthin and beta-carotene were observed through HPLC. Among the compounds detected, lutein and beta-carotene were the most abundant carotenoids found in both shoots and petioles of all three species. Violaxanthin was only detected in I. batatas shoots. Overall, carotenoid content was observed to be higher in the shoots than in the petioles, where I. batatas contained the highest amount of total carotenoid, followed by M. esculenta and A. carambola. The opposite trend was observed in the petioles, where A. carambola petioles had the highest carotenoid content, while I. batatas contained the least.

Research limitations/ implications - The distribution and abundance of these individual carotenoids suggested that the petioles contained the highest amount of carotenoid, contributing to its high pro- vitamin A activity, and could be potentially useful for medicinal application, as it can act as storage site that is not as prone to natural drying or degradation during harvest and sample storage. Future research work should include improvements in the extraction and purification procedures as well as robust identification methods which may lead to better detection and identification of other compounds that could attribute to its bioactivity, to complement the findings of the current study.

Practical implications - This analysis provides valuable information on the importance of underutilized traditional vegetables as important biofactories for sustainable production of valuable pigments (such as carotenoids) with medicinal benefits and can further be exploited in various industries, such as in formulation of functional natural colorants. This study also highlights the importance of petiole as a storage site of pharmacologically active compounds that is not as prone to natural drying or degradation during harvest and sample storage.


Keywords

Author Keywords: Underutilized; beta-carotene; Lutein; Ulam; Violoxanthin; Vitamin A


KeyWords Plus: BETA-CAROTENE; ANTIOXIDANT; LUTEIN; PIGMENTS; SPICES; LEAVES; FRUITS

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