Faculty of Science
Botany Department

Morphological, phytochemical and molecular studies on some species of Myrtaceae Juss.

A Thesis
Submitted for the Degree of Doctor of Philosophy of Science
in Botany (Taxonomy of Flowering Plants)

By

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Declaration

This thesis has not been submitted for a degree to this or any other University.

Nareman Kamal Hosney

Dedication

I dedicate this work to

My devoted parents

My lovely sister

My husband

My son Youssef

Nareman Kamal

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Abstract

Abstract

The macromorphological characters (leaf macromorphology, lamina vein architecture, lamina epidermal characters) were examined using both light and scanning electron microscope. Also, chemotaxonomic study includes molecular study and phytochemical screening using qualitative and quantitative analysis were made to evaluate these characters in taxa delimitation. The 26-studied species belonging to 15 genera of family Myrtaceae, were collected from Mazhar Botanical Garden, Al-Baragil, Giza, Egypt during spring season of 2015.

The obtained results revealed that, the simple leaves with entire margin found in all taxa while the leaf arrangement, lamina shape, apex and base showed great variation among them. Pinnate simple brochidodromous leaf venation is the most common, although other patterns were also recorded *viz.* cladodromous, eucamptodromous and craspedodromous. The irregular reticulate tertiary and quaternary vein fabric was frequently observed. The oil glands with various shape and overlying cells were also recorded in all taxa except in *Corymbia ficifolia* and *Melaleuca linariifolia*.

The leaves are generally hypostomatic, although amphistomatic observed in eight taxa. The homostomatic leaf is the most dominant than heterostomatic type. The stomatal types showed extensive variation but the paracytic type is more common. Where the trichomes are present, a specific type is the eglandular, unicellular, unbranched (straight or coiled). The epidermal cells shape, the anticlinal walls, sculpturing patterns, the epicuticular wax, stomatal aperture shape and level on both ad\abaxial leaf surfaces are beneficial in taxa identification and delimitation.

Eight SCoT primers were performed to study the genetic diversity between the studied taxa. the total number of amplified fragments was 125; 119 of them were polymorphic, while the remaining six are monomorphic. The total number of specific markers produced were 19. Only one of them scored for the absence of the band while the other 18 markers scored for the presence of unique band. Only ten taxa scored specific markers. Seven primers produced specific markers with largest number generated by primer SCoT 5 (six markers) and the lowest number generated by SCoT 2 and SCoT 5 (one marker for each), while primer SCoT 4 didn’t reveal any specific markers.

The phytochemical screening revealed the presence of flavonoids, tannins and saponins in all studied taxa, while anthraquinones and anthocyanidins in 23 taxa, cinnamic, benzoic acid derivatives and coumarins in eight taxa. The highest phenolic content recorded in *Xanthostemon fruticosus* while the lowest in *Pimenta dioica*. The

highest concentration of flavonoids found in *Melaleuca linariifolia* while the lowest in *Agonis flexuosa*. *Xanthostemon fruticosus* exhibited the maximum antioxidant capacity, while *Melaleuca linariifolia* had the minimum value.

The obtained results were analyzed numerically (by jmp 14 software) to construct three dendrograms; one of them based on the leaf morphological characters, while the other based on molecular characters.

A combined dendrogram based on the above resulted characters in addition to the phytochemical characters was constructed. The combined dendrogram grouped 13 out of the studied taxa (berry fruited) with four capsular fruited taxa and the remaining nine capsular fruited taxa in the other group. Consequently, our results become to a considerable extent in agreement with **Niedenzu** classification (based on the macromorphological characters).

Key words: Myrtaceae – Leptospermoideae – Myrtoideae – SEM – SCoT markers – architecture – phytochemistry – numerical analysis.

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