



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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**(2018)**





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**Degree:** Doctor of Philosophy of Science in Botany (Taxonomy of Flowering Plants)

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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*





## Acknowledgements

First and foremost, I am grateful to Allah endlessly, the most beneficent and merciful. I would like to acknowledge, with appreciation, my debt of thanks to **Prof. Dr. Karima Abd-Elkhalak Hamed, Prof. Dr. Soad Abd-Allah Hassan, Dr. Alsafa Hassan Mohamed Hussein** (Taxonomy of Flowering Plants, Botany Department, Faculty of Science, Ain Shams University), **Dr. Mosad Ahmed Ghareeb Ibrahim** (Lecturer of Medicinal Chemistry, Biochemistry & Molecular Biology and Medicinal Chemistry Department, Theodor Bilharz Research Institute) for suggesting the present point of the thesis and managing this work, appreciated assistance, guidance and genuine efforts throughout this work.

Many thanks to Prof. **Dr. Maher Mohamed Shehata** and **Magda Mohamed El-Araby** (former Head of Botany Department, Faculty of Science, Ain Shams University) and Prof. **Dr. Hanaa Mostafa Shabara** (present heads of department) for their help and support which was given to me to complete this work.

Also, my deep thanks and gratitude to Prof. **Dr. Amal Mohamed Saad**, Associate Professor of Medicinal Chemistry, Department of Biochemistry & Molecular Biology and Medicinal Chemistry, Theodor Bilharz Research Institute, for her kind internal supervision, continuous guidance, great help and facilities provided for producing this work.

Also, I am greatly thankful to **Dr. Tirresa Labib** the manager of Mazhar Botanical Garden for her sincere help in collecting and identifying plant samples from Mazhar Botanical Garden.

Special appreciations to the staff members and colleagues of Taxonomy Unit for their kindness and support.

I am indebted to the staff members and colleagues of Botany Department, Faculty of Science, Ain Shams University.



# *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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