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SCOPE OF THE THESIS

The Moraceae is a large family, belonging to a large order of tropical and temperate distribution.

In the present work, nineteen species belonging to *Ficus* have been studied. The main objectives of the present study are:

1- Study the taxonomic information through the investigation of palynological and DNA cretiria.

2- Compare and bind out the relationships between the studied species on the bases of palynological criteria and DNA fingerprint using ISSR-PCR analysis.

3- Design cumulative tables showing similarities and differences to provide a full identification among the studied species.

4- Estimate the level of polymorphism and genetic similarity among the studied species.

5- Identify some moleculer genetic markers which help in identification of the taxa under investigation.

6- The results obtained are treated by cluster analysis. The dendrograms are discussed and compared with the previous treatments of the *Ficus.*

PREFACE

The Moraceae includes a number of genera and species, which seriously fluctuate among taxonomists. It is a subcosmopolitan family including 75 genera and about 3.000 species distributed mainly in tropics and subtropics (**Mabberley, 1997**). All members of this family are mainly monoecious or dioecious trees or shrubs, very rarely herbs, sometimes becoming epiphytic (**Hutchinson, 1973**).

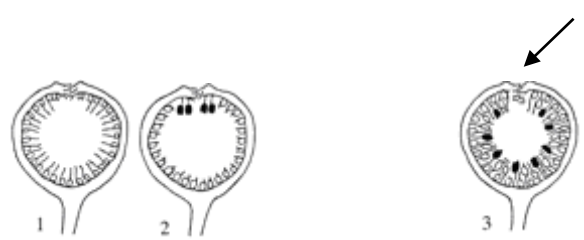
Ficus is the old Latin name of fig (**Stearn, 1996**). *Ficus* (Moraceae) constitutes one of the largest genera of angiosperms (**Frodin, 2004**), consisting of about 1,000 species from pan-tropical and subtropical origins **(Wagner *et al.*, 1999)** and form a distinctive monophyletic clade within the family **(Judd *et al.*, 1999)**.

Ficus species are deciduous or evergreen monoecious or dioecious lactiferous trees, shrubs, and woody root-climbing vines, many of them beginning life and sometimes remaining as epiphytes or also overwhelming and strangling their host and becoming free-standing; stem and twigs thick to thin, unbranched and palmoid to highly branched with flattened sprays of foliage; stipules enclosing buds at first, small to large, persistent or quickly falling but leaving distinctive ring-like scars at the nodes.

Some trees have thick fleshy aerial roots which are frequently produced from the branches and developing into supplementary ones in old trees.

Leaves simple, thin to thick, spirally arranged, alternate or occasionally opposite, pinnately or more or less palmately veined, very varied in size, form, surfaces, venation details and pubescence and sometimes quite showy.

Flowers minute, unisexual, their perianth reduced, wholly enclosed from two to several thousand within a fleshy receptacle (the fig); male, female and gall flowers (short-styled sterile female): all three found in monoecious figs (subg. *Pharmacosycea*, *Sycomorus* and *Urostigma*) but male and gall flowers found in dioecious figs (subg. *Ficus*). Male flowers usually divided into 2-6 sepals. Stamen 1-filament short, erect, anther innate, ovoid, broad and subrotund, 2-celled, the cells opening longitudinally; female flowers have sepals or lobes of calyx which usually narrower than of the male flowers. Ovary sessile, erect or oblique, surmounted by the lateral elongated style crowned by a 2-lobed stigma, ovule suspended from the apex or lateral below the apex of the cells, anatropous; gall flowers sterile, providing homes for fig-wasps of *Blastophaga*, *Ceratosolen* and other genera.



Gynodioecious Fig Monoecious Fig

Figure (1-3): The Distribution of unisexual florets in figs of monoecious and gynodioecious *Ficus.* **(Weiblen, 2000)**

There are two types of figs on separate plants in gynodioecious *Ficus*, seed figs containing long-styled pistillate florets (Figure 1) and gall figs containing short-styled pistillate florets and staminate florets (Figure 2). Monoecious species have a single type of fig containing pistillate florets with styles of varying length and staminate florets (Figure 3). Anthers are blackened to indicate the position of staminate florets near the ostiole in Figure 2 and dispersed among the pistillate florets in Figure 3.

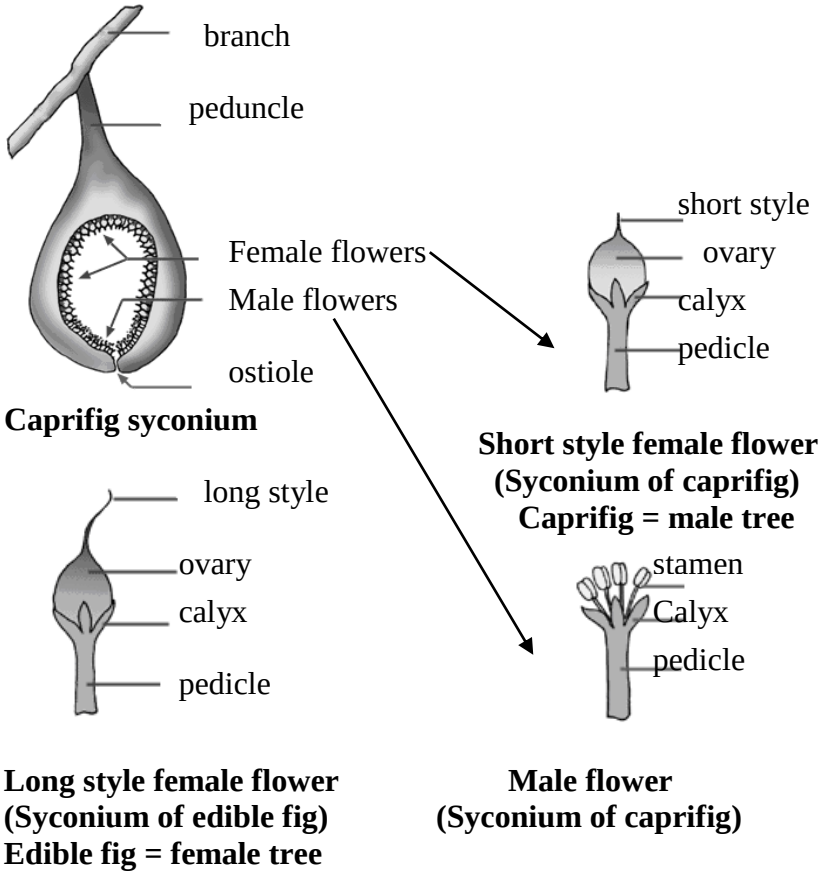


Figure (4): Structures of dieociously figs illustrating the morphology of caprifig syconium, gall, male and female flowers.

Receptacles of varying sizes and maturing with differing colours and other markings, sessile or pedunclate, sometimes subtended by persistent or early caduceus bracts, naked or more or less covered with bracteate scales, globose, oblate, pyriform or oblong, the apex topped by a small, sometimes elevated ostiole enclosed by bracteole. Seeds are small and numerous. **(Bailey & Bailey, 1992)**

Ficus is represented in wild Egyptian flora by three taxa viz. *F. salicifolia* Vahl, *F. pseudosycomorus* Decne and *F. carica* L. var. *rupestris* Hausskn. All of which are either of rare or of very rare occurrence **(Täeckholm, 1974)**. **Boulos** (**1999)** changed the name of these taxa; *F. salicifolia* Vahl into *F. cordata* Thunb., subsp *salicifolia* (Vahl); *F. pseudosycomorus* Decne into *F. palmata* Forssk and *F. carica* L. var *rupestris* Hausskn into *F. carica* L. However, the number is compensated by numerous cultivated taxa that were introduced to Egypt, particularly during the late 19th century and the 1st half of the 20th century. *F. carica* L. is cultivated in Egypt since historic ages.

The genus includes many species of economic importance; among which are *F. carica*, *F. racemosa* and *F. sycomorus* with edible fruits while *F. benghalensis*, *F. religiosa*, *F. lyrata*, ….etc. are known to constitute a major portion of the cultivated trees for shading, ornamentation and minimization of pollution and employed for construction purposes. Moreover *F. hispida* and *F. infectoria* are used as fodder for cattle and elephants. Some species exude latex used as birdlime, vermifuge, meat-tenderizer and chill-proofing agent in beer, while others provide bark cloth.

HISTORICAL INTRODUCTION

I. Systematic Treatment

In all the classification systems, *Ficus* is placed in the Moraceae. The Moraceae was named by **Link (1831)** and conserved against older names of the family as Artocarpaceae Dorsteniaceae Chev, and Ficaceae Dumont **(INSP, 2003).** The family name is based on *Morus* L. as its type genus (**Farr *et al*., 1979**).

Ficus was named by **Linnaeus in 1753 (Sp. P1. 1059, 1 May.1753)**, based on the old Latin name of fig (**Stearn, 1996**). It was later lectotypified by N.L.Britton "in F1. Bermude 101, 28 Feb. 1918". The assigned lectotype was *F. carica* (**Farr and Zijlstra, 2003**).

A. The Relations of The Moraceae to The other Families

According to system of **Bentham and Hooker's (1862-1883)**, the Moraceae was not considered as a separate family, but was included in an expanded Urticaceae which is included six tribes [(Artocarpeae (including ***Ficus***), Cannabineae, Celtideae, Conocephaleae, Moreae and Ulmeae) (Figure 5)].

Engler (1897) placed the family in Urticales under subclass Archichlamydeae. The order constitutes three families. In the modified version of Engler's system presented by **Melchior (1964)** the Urticales includes five families instead of three (Figure 6).

Hallier (1912) followed Engler's classification and included this family in Terebinthinae, which suggested to be derived from the Lardizabaleae of the Ranales (Figure 7).

Bessy (1915) placed the family under Malvales and the latter has been originated from Rosales. He also arranged Rosales and Malvales under subclass: Strobiloideae with superior ovary (Figure 8).

According to **Hutchinson (1948)**, the family was classified under division Lignosae and order of Urticales (Figure 9).

Takhtajan (1980) included the family under order Urticales consisted of five families [(Cannabaceae, Cecropiaceae, Moraceae, Ulmaceae and Urticaceae).(Figure 10)].

Cronquist (1981) included the family under order of Urticales which occur under sub-class Hamamelidae and consisted of five families [(Barbeyaceae, Cannabaceae, Moraceae, Ulmaceae, and Urticaceae)(Figure 11)].

Thorne (1983) placed the family in order Urticales of super order Malviflorae. Urticales consisted of three families (Ulmaceae, Urticaceae and Cannabaceae) but in **1997** the Urticales included five families instead of three [(Cannabaceae, Cecropiceae, Moraceae, Ulmaceae and Urticaceae)(Figure 12 & 13)]

Cronquist (1998) ex Reveal placed the family under the order of Urticales which includes seven families [(Barbeyaceae, Cannabaceae, Cecropiaceae Moraceae, Physenaceae, Ulmaceae and Urticaceae)(Figure 14)].

Figure (5): Bentham & Hooker's Classification (1862-1883)

Phyllum: Phanerogams
Class: Dicotyledoneae
Subclass: Monochlamydeae
Series VII: Unisexuals
Family3: Urticaceae
Tribe V: **Artocarpeae**

Figure (6): Engler's Classification (1897)

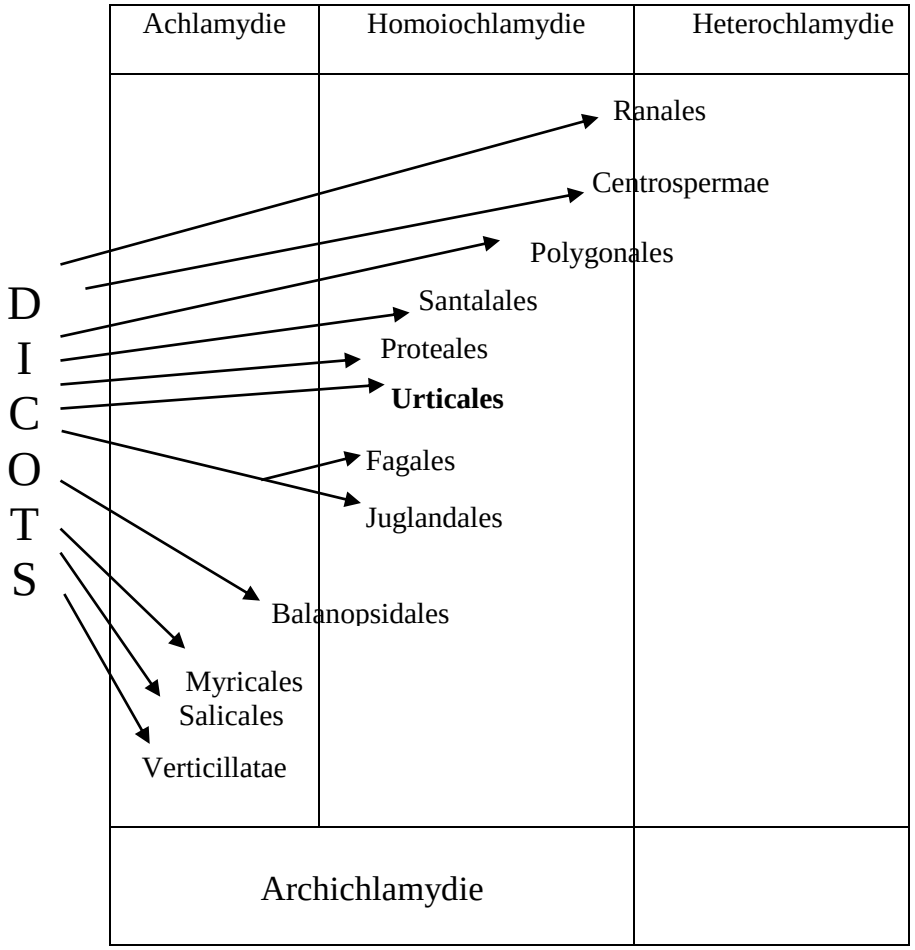


Figure (7): Hallier's Classification (1912)

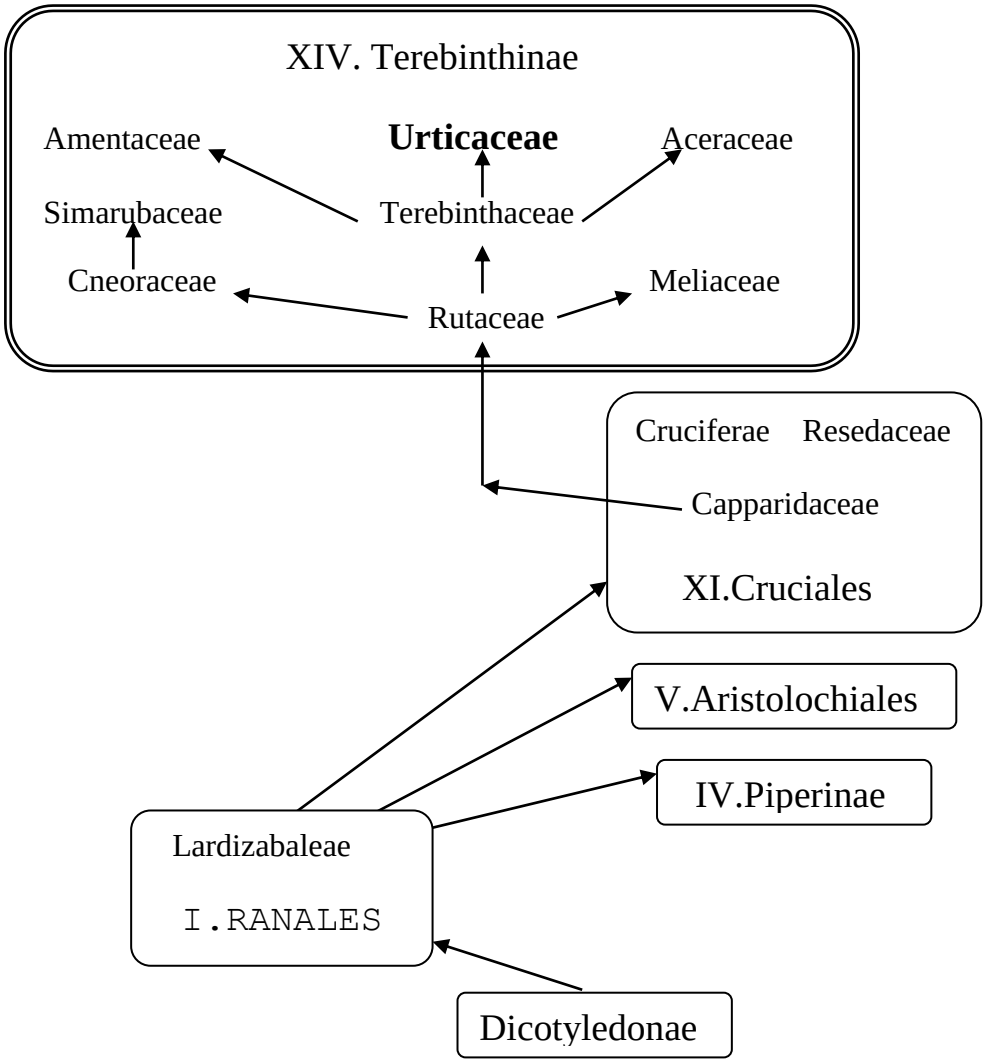
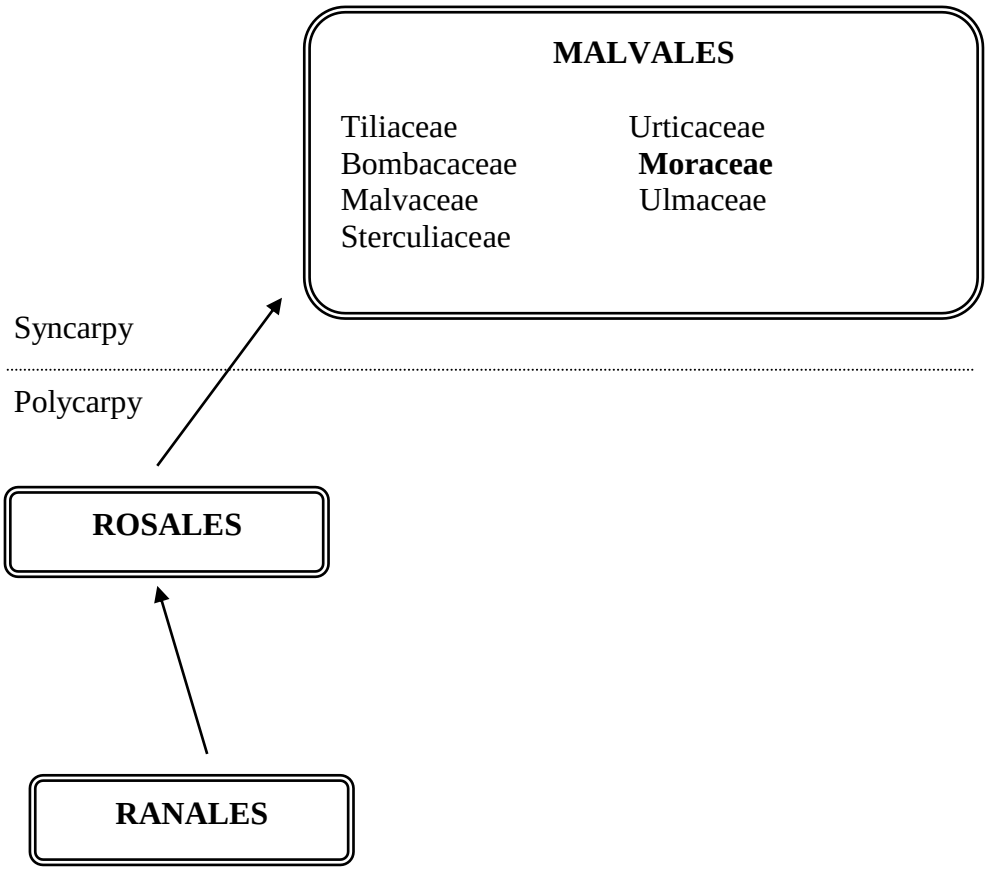


Figure (8): Bessy's Classification (1915)

Epigyny	Sympetaly	Zygomorphic flowers
Hypogyny	Polypetaly	Actinomorphic flowers



Class: DICOTYLEDONEAE Subclass: STROBILOIDEAE

Figure (9): Hutchinson's Classification (1948)

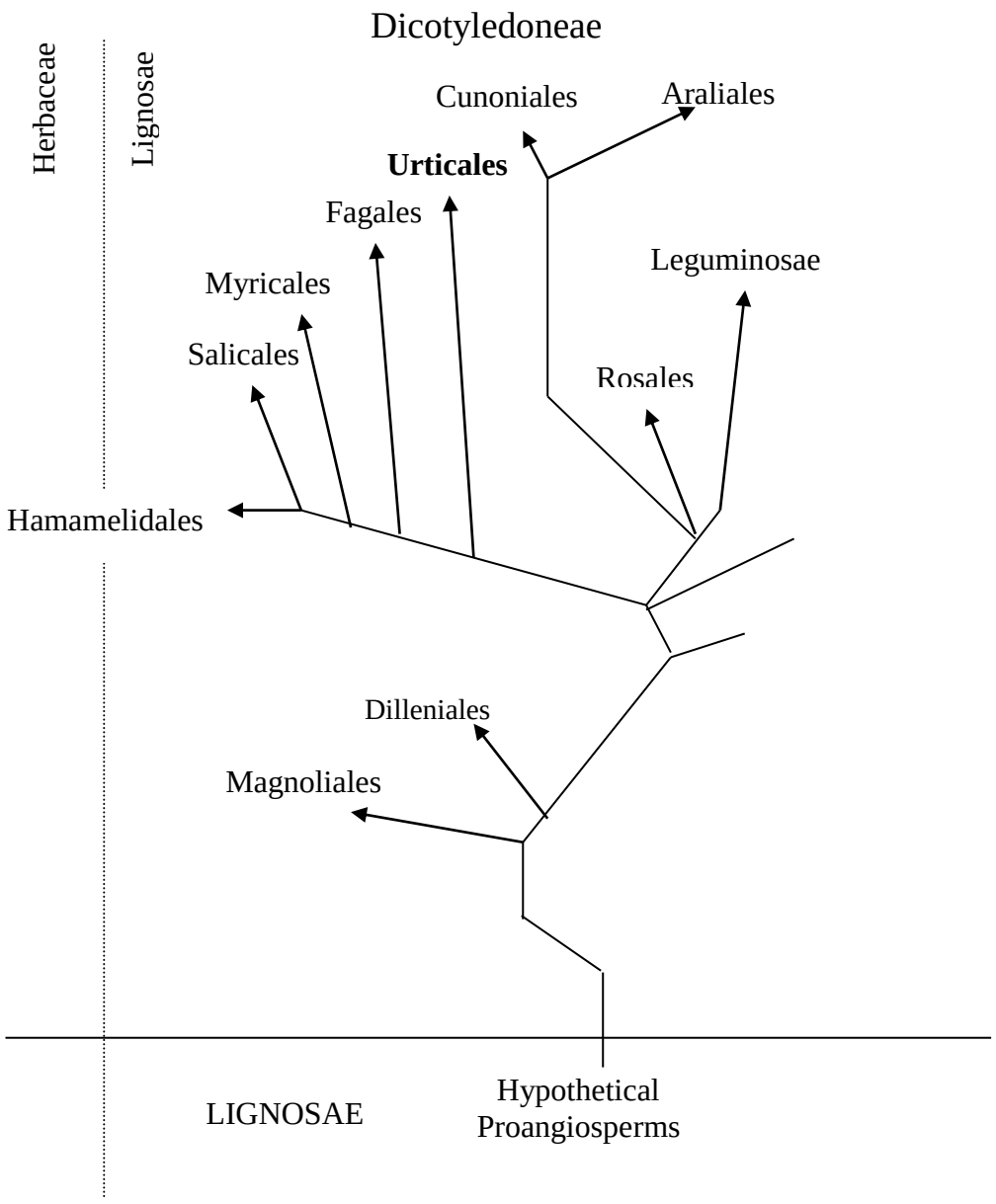


Figure (10): Takhtajan's Classification (1980)

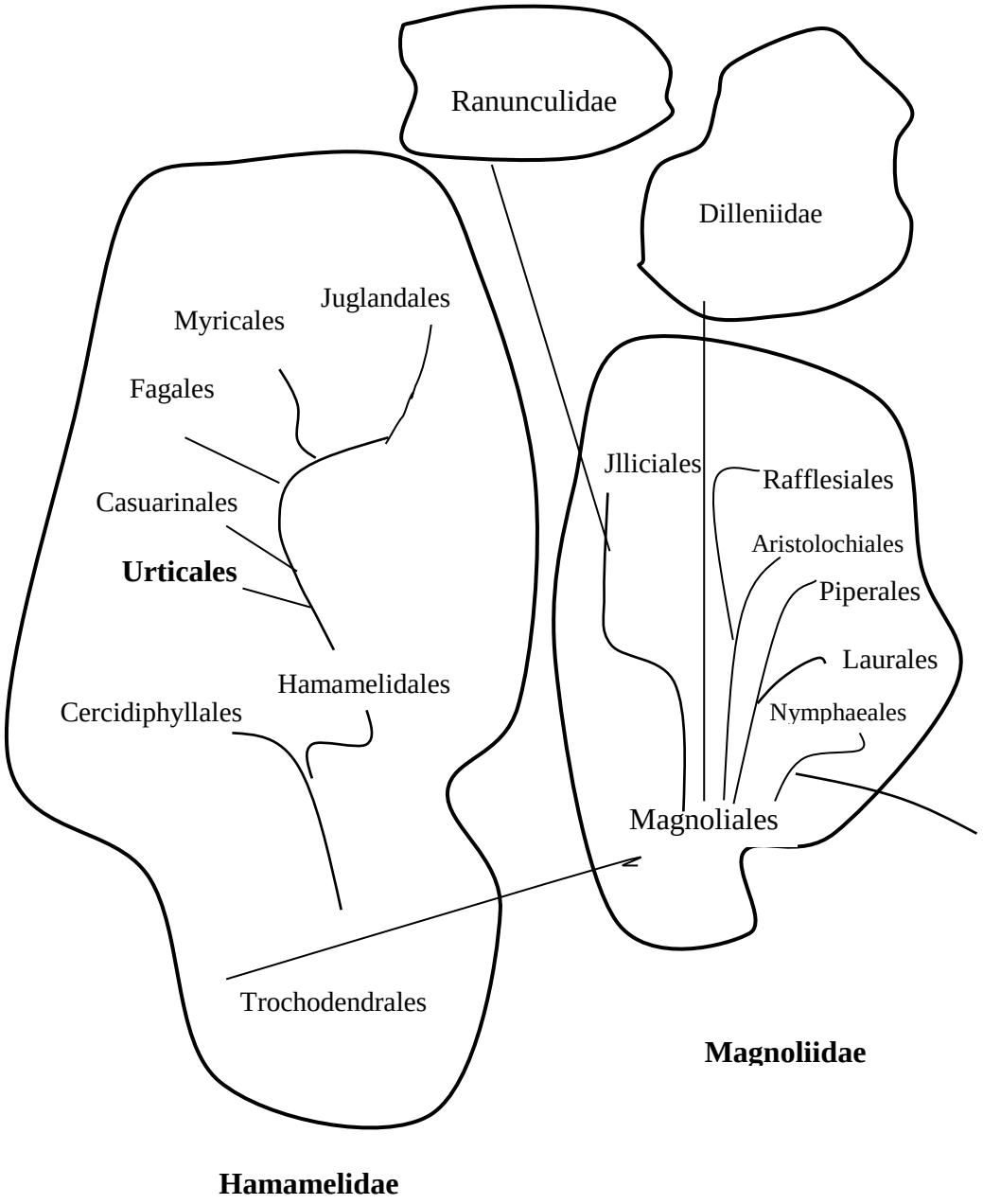


Figure (11): Cronquist's Classification (1981)

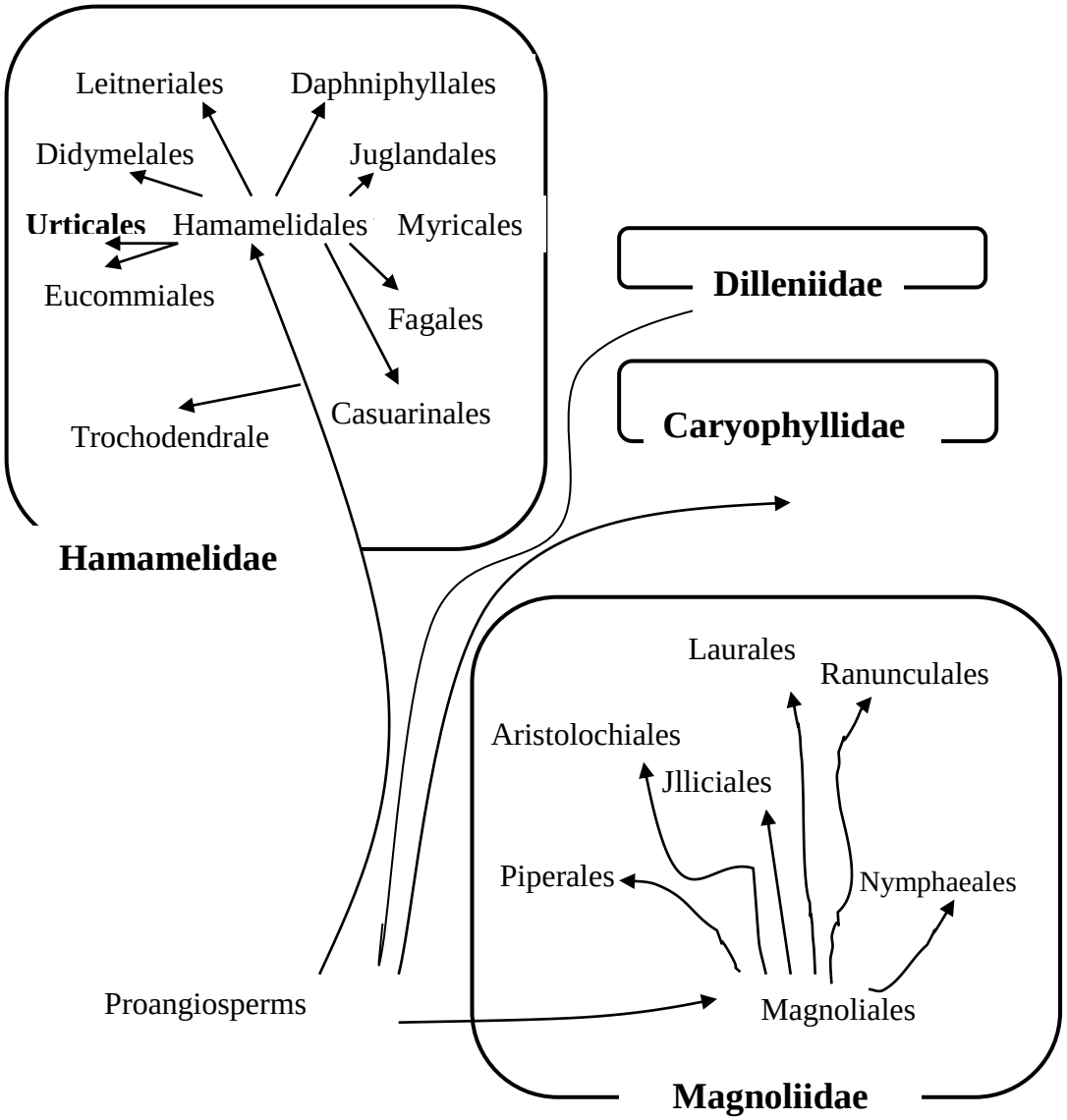


Figure (12): Thorne's Classification (1983)

Subclass: Dicotyledoneae (Annonidae)
Super order: Malviflorae
Order: Urticales
Family I: Ulmaceae
Family II: **Urticaceae**
Familv III: Cannabaceae

Figure (13): Thorne's Classification (1997)

Subclass: Dicotyledoneae
Super order: Malvanae
Order: Urticales
Family I: Ulmaceae
Family II: **Moraceae**
Family III: Cannabaceae
Family IV: Cecropiaceae
Family V: Urticaceae

Figure (14): Cronquist's Classification (1998) ex Reveal

Subclass: Hamamelidae
Order: Urticales
Family I: Barbeyaceae
Family II : Ulmaceae
Family III: Cannabaceae
Family IV : **Moraceae**
Family V: Cecropiaceae
Family VI : Urticaceae
Family VII: Physenaceae