WOOD ANATOMY OF THE OLEACEAE

by

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Summary

The wood anatomy of all 24 genera of the nearly cosmopolitan family of the Oleaceae is described on the basis of a study of 137 species (c. 300 samples). The wood anatomical diversity has been used for a phenetic as well as a phylogenetic classification. Important common elements of those classifications are: heterogeneity and likely unnatural status of the genera *Olea* and *Chionanthus s.l.* (including *Linociera*) as conceived by current taxonomic delimitation; support for the recognition of the subfamily Oleoideae (including *Schrebera* and *Comoranthus*), but excluding *Myxopyrum* as a natural group; and inclusion of the genus *Nyctanthes* in an isolated position in the Oleaceae. In the phenetic classification 6 partly overlapping groups are recognised: I. all genera traditionally placed in the Jasminoideae plus *Myxopyrum* and *Syringa* p.p.; II. *Ligustrum* and *Syringa* p.p.; III. *Comoranthus* and *Schrebera*; IV. *Chionanthus p.p.* (= *Linociera*), *Forestiera*, *Fraxinus*, *Haenianthus*, *Hesperelaea*, *Noronhia*, *Olea* p.p., *Tessarandra*; V. *Chionanthus s.s.* (temperate species), *Nestegis*, *Notelaea*, *Osmanthus*, *Olea* p.p., *Phillyrea*, and *Picconia*; VI. *Nyctanthes*. Groups II, III, IV and V constitute most of the Oleoideae in recent and traditional systems of classification. In the cladistic analysis these four groups form together a monophyletic group, supported by an allopolyploid karyotype, and the presence of flavone glycosides. The subfamily Jasminoideae is not supported by shared apomorphic anatomical, karyological or flavonoid character states.

Ecological trends in the wood anatomy of the family include weak dependencies on latitude and moisture availability of quantitative characters such as vessel diameter, vessel frequency, and vessel member and fibre length in agreement with general trends established in other woody plant groups. Fibre-tracheids, spiral thickenings, and the character syndrome of oblique to dendritic vessel distribution with associated vascular tracheids and large intervessel pits, are mainly restricted to extratropical Oleaceae. Three alternative strategies are hypothesised for optimal safety and efficiency of the hydraulic architecture of the Oleaceae.

A tentative evolutionary scenario based on the analysis of ecological trends in extant Oleaceae and the most parsimonious cladogram is provided. Two dichotomous identification keys to the woods of the Oleaceae are given. Most individual generic descriptions are followed by taxonomic and/or wood anatomical notes.

**Key words**: Phylogenetic classification, phenetic classification, ecological and functional wood anatomy, xylem evolution, wood identification.

Introduction

The Oleaceae constitute a nearly cosmopolitan family of trees, shrubs, and more rarely climbers. Many of its members are of economic interest as ornamental species (*Forsythia*, *Jasminum*, *Ligustrum*, *Osmanthus*, *Syringa*, and others), for their timber (e.g. species of *Chionanthus*, *Fraxinus*, *Olea*), or their fruits (*Olea*). The great diversity of wood structure within the family has been recognised since the early days of comparative wood anatomy by Sanio (1863), Müller (1876), and Kohl (1881) and has since been summarised by Solereder (1899, 1908) and Metcalfe and Chalk (1950). Kohl’s thesis (1881), and to a lesser extent the combined wood anatomical and cytological study by Sax and Abbe (1932) are the only monographic wood anatomical surveys for the family to date, and these publications deal with a part of the genera only. Kohl’s taxonomic conclusions are completely at odds with those proposed in the present study. This is probably because of his use of a classification and terminology of wood anatomical elements which has since been found deficient, as already indicated by Solereder (1885), and because of the limited knowledge of the systematic and diagnostic value of certain wood characters at his time.

A renewed wood anatomical survey of the Oleaceae is in order to contribute to the understanding of intergeneric affinities, which continues to be the subject of discussion (cf. Bentham & Hooker 1876; Harborne & Greene 1980; Johnson 1957; Kiew 1983, 1984; Kiew & Baas 1984; Knoblauch 1895; Piechura & Fairbrothers 1983; Sax & Abbe