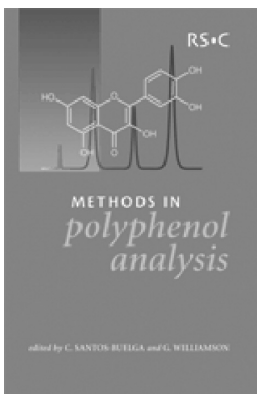


Grape and Brain

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Methods in Polyphenol Analysis

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Methods in Polyphenol Analysis is a collation of 16 practical, concise chapters written by polyphenol specialists from university and industry. They cover the fundamentals of extraction, purification, identification, and quantification of monomeric and polymeric polyphenols and the challenges associated with handling them. The book will be of most use to researchers in the fields of health, agriculture, and food science.

Maximizing extraction efficiency, while minimizing degradation and contamination, is central to polyphenol analysis so it is appropriate that an overview of extraction methods and issues are addressed in the first two chapters of the book. Chapter 1 outlines the general themes of solvent and solid-phase extraction with a focus on food as a matrix. Chapter 2 tackles extraction from biological fluids and tissues, a critical task in the assessment of absorption, metabolism, and tissue distribution of dietary polyphenols. The authors include an extensive table of methods used in the literature but express concern over widespread use of non validated procedures.

Hyphenated LC techniques are addressed in chapters on LC-MS (Chapter 3) and LC-NMR (Chapter 6) as they are applied to polyphenol identification. LC-MS is proving increasingly popular and powerful for polyphenol identification, particularly relevant when applied to the heterogeneous mixture of polymerized polyphenols known as proanthocyanidins (or tannins). The LC-MS chapter is briefer than one would have expected, given the amount of emerging literature, however the main benefits, challenges, and applications of the technology are adequately addressed. LC-NMR theory is succinctly presented, followed by a frank appraisal of the limitations. Access to such technology is relatively limited, particularly in Australia; however the authors highlight the complementary nature of its use in conjunction with other techniques.

Chapters 4 and 5 focus on HPLC, a cornerstone of polyphenol analysis, coupled to coulometric detection and diode array detection respectively. The chapter on coulometric

detection, or the use of a chemicals redox properties, provides a very useful introduction to the tool. One of the benefits particularly relevant for polyphenol is the ability to differentiate coeluting compounds. Chapter 5 summarizes very useful 'rules of thumb' regarding elution order and UV spectral characteristics for polyphenol glucosides, flavan-3-ols (i.e. catechins, tannins), flavones and flavanols, and others. This is a comprehensive and well-written chapter of great use to the polyphenol practitioner.

Chapter 7 highlights the complexity of the redox properties associated with polyphenols but shows how sound chemistry and use of protecting groups can deconvolute the antioxidant mechanism and structure–function relationships that are associated with many of the claimed health benefits of polyphenols.

Chapter 8 gives a useful, though brief, account of enzymatic methods for synthesis of reference glucosides of quercetin, as these are the predominant metabolites derived from flavonol-rich food. A handy pK_a 'lookup' table accompanies a comprehensive overview of the synthetic strategies for chemical synthesis of flavanoid conjugates. A similar chapter that reviewed the state of polymeric polyphenol synthesis in order to access tannin reference compounds would have been a useful addition, as sourcing these standards is primarily achieved through laborious isolation of small quantities from natural sources.

UV, fluorescence, and electrochemical detection protocols for polyphenol quantitation are reported in Chapter 10 and is essentially an expansion on some of the material presented in earlier chapters.

Chapters 11 to 16 offer in-depth protocols for analysis and purification of the major classes of polyphenols; these are catechins, proanthocyanidin oligomers, polymeric proanthocyanidins, chlorogenic cinnamates, anthocyanins, and, as one group, the flavones, chalcones, and dihydrochalcones. Of noteworthy mention are the tables of NMR shifts, coupling constants, and physical properties for many of these compounds that potentially save much time searching through primary literature sources. Many principles and techniques addressed in earlier chapters are targeted to specific classes.

The book is suitable for new and established researchers in the field and could be a useful source for teaching material. The use of clear, up-to-date protocols for procedures is a great feature, and the diversity of analysis techniques that are described allows polyphenol practitioners to assess the merits of adopting alternate approaches. In summary, *Methods in Polyphenol Analysis* would be a very useful addition to any laboratory involved in polyphenol chemistry.

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