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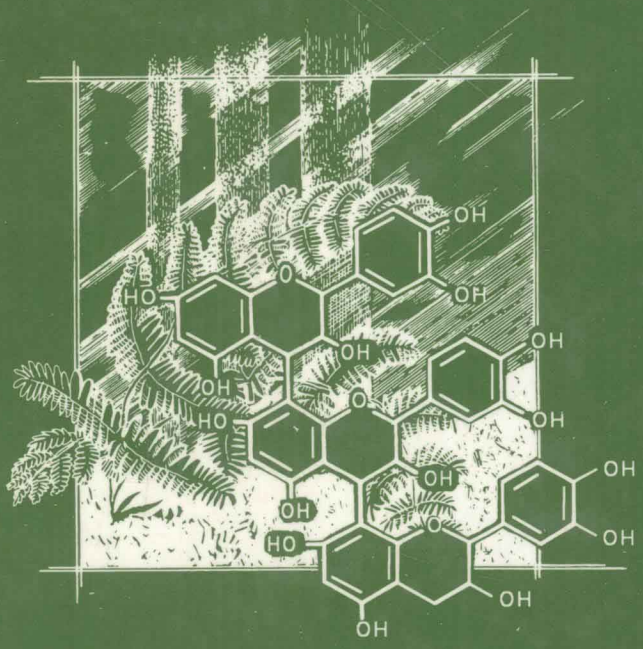
PLANT POLYPHENOLS

Synthesis, Properties, Significance



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PLANT POLYPHENOLS

Synthesis, Properties, Significance

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Volume 59 PLANT POLYPHENOLS: Synthesis, Properties, Significance
Edited by Richard W. Hemingway and Peter E. Laks

PREFACE

This book was developed from the proceedings of the 2nd North American Tannin Conference held in Houghton, Michigan, June, 1991. The objective of this conference was to bring together people with a common interest in plant polyphenols and to promote interdisciplinary interactions that will lead to a better understanding of the importance of these substances.

Another objective of this conference was to extend the 'tannin family' by making special efforts to encourage participation by scientists outside the United States, obtain more coverage of the hydrolyzable tannins, and further broaden the scope of coverage from the initial concentration on forestry and forest products. Comparison of the contents of this book with 'Chemistry and Significance of Condensed Tannins' that resulted from the proceedings of the 1st North American Tannin Conference shows the degree that these objectives were met. In developing the second conference, care was taken to assure that this book extends rather than duplicates the coverage of the first conference. Therefore, the two books should be taken together to obtain an up to date coverage of the broad area of chemistry and significance of plant polyphenols.

Our thanks go to the authors who so kindly contributed chapters and so patiently responded to our requests. We thank the Conference Assistance Staff of Michigan Technological University for their help in planning and conducting the conference. The efforts of Debbie Wolfe and Benita Anderson of the Southern Forest Experiment Station, Pineville, Louisiana were essential in preparing the contributions for publication. Helen Hemingway and Mandy Laks deserve special thanks for their patience during the period of concentration needed to develop this book. Gregory Safford of Plenum Publishing Company was also very helpful to us.

Our greatest reward has been to see the 'tannin family' grow so well during the four years between the two tannin conferences. Thanks to the contributions of so many dedicated scientists, an effective medium for exchange and consolidation of information among especially diverse disciplines has been established.

Richard W. Hemingway Peter E. Laks Susan J. Branham

February, 1992

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INTRODUCTION OF PROFESSOR DAVID G. ROUX, RECIPIENT OF THE 2ND NORTH AMERICAN TANNIN CONFERENCE AWARD

John W. Rowe

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INTRODUCTION OF PROFESSOR ROUX

What a delightful place for this second international conference on plant polyphenols, especially at this time of year! And how delightful to see old friends including Dick Hemingway who fortunately for us all ignored my advice years ago 'to avoid tannin chemistry because it was a jungle out there.' It is indeed a pleasure to participate in this prestigious 2nd North American Tannin Conference, and I am particularly pleased to present the Conference Award to Professor David Roux. Our audience today includes not only his former students, colleagues, and collaborators from around the world but also his successor at Bloemfontein, Professor Daneel Ferreira. Even those of you here today who have not had personal contact with Professor Roux know of him, for it is hardly possible to do research on polyflavonoid tannins without referring to him.

This exciting area of natural products chemistry has been receiving increased attention of late with several significant publications such as the proceedings of the previous conference 'Chemistry and Significance of Condensed Tannins,' Haslam's excellent book 'Plant Polyphenols - Vegetable Tannins Revisited,' and several chapters in the book 'Natural Products of Woody Plants,' all published in 1989. Many of the authors and contributors to these publications are among the distinguished scientists from throughout the world present with us today. But especially notable is the scientist we now honor, Professor David Roux. His group's impressive contributions to this field form the basis on which much recent research has been built. You will find his work cited repeatedly in the papers to be presented at this meeting, and he is extensively cited in reviews such as those mentioned earlier. How many of you here today would have been able to accomplish what you have were it not for the pioneering research of David Roux?

Plant Polyphenols, Edited by R.W. Hemingway
and P.E. Laks, Plenum Press, New York, 1992

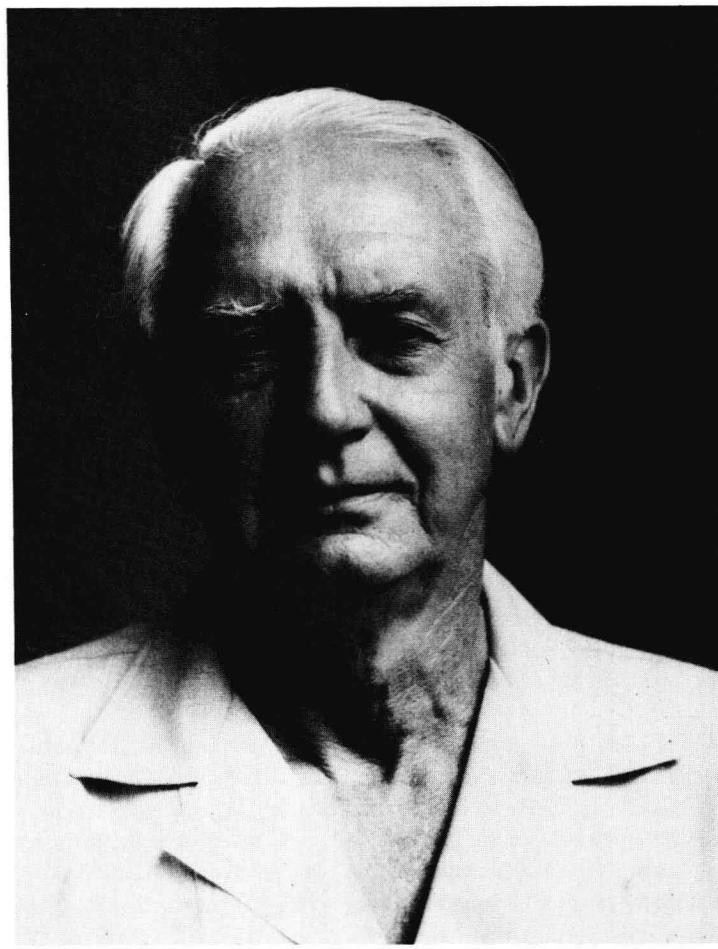
Professor Roux received his PhD. from Rhodes University in 1952 for research on condensed tannins while working at the Leather Industries Research Institute where he later became Chief Research Scientist. What a different world the chemist worked in then! Condensed tannins were largely dismissed as the brown gunk in the bottom of the flask. Chromatography was in its infancy, and modern spectral methods of analysis were lacking. Although simple polyphenols were being isolated, their sensitivity to acid, base, air, and light plagued the organic chemist, and many isolations were of artifacts rather than the optically pure original natural product. How this field has grown in the past 40 years!

Most of Professor Roux's career was as Professor of Organic Chemistry and Head of the Department of Chemistry at the University of the Orange Free State, Bloemfontein, South Africa. CSIR awarded him a research unit on flavonoid chemistry, and he served as its director until he retired in 1985. Since then, he has been involved in research administration. He has travelled widely lecturing and collaborating with colleagues throughout the world. He is the recipient of a number of prizes, awards, and even a gold medal. He is an active member, fellow, and officer of numerous scientific groups including serving as chairman and president. Four dozen students have received advanced degrees under his tutelage.

Professor Roux's life work has been on plant phenolics (including tannins) that are essentially ubiquitous in plants and are in most cases the main extraneous fraction. They contribute significantly to color, decay resistance, and many of the properties of the plant. They are particularly important in contributing to the characteristics of wood. Although tannins have been historically important in tanning leather, today, they are important in adhesives, oil-well drilling muds, ore recovery, binders for foundry cores, urethane surface coatings, water treatment, and so forth. Wattle bark with 35 percent of a high-quality tannin has long been a major commercial product from South Africa, and thus a major subject for investigation by Professor Roux and his group. But plant polyphenols are significant in many other ways, ranging from chemotaxonomy, studies of plant biochemistry and biogenesis, to potential pharmaceutical uses such as antifungal flavans and isoflavans, L-dopa, insecticidal rotenoids, estrogenic isoflavones and isoflavans, and many other physiologically active polyphenols, a number of which have been investigated by Professor Roux.

Although the commercially significant wattle tannins have been a major subject of Professor Roux's research, his work has covered a broad range of significant accomplishments covering many aspects of polyphenol chemistry. Highlights from some of his 218 publications can be summarized in nine categories;

- Photolysis of flavonoids with the discovery of the methoxyl-hydroxymethyl inversion and access to the stereochemically unnatural 4-aryl-2,3-*cis*-3,4-*cis*-flavan-4-ol, and the pterocarpan-isoflavan conversion.



Professor David G. Roux who was presented with the 2nd North American Tannin Conference Award in recognition of his pioneering research on the chemistry of polyflavanoids.

- New isomers and analogs. These include the first demonstration of the isomeric mopanols; crombeone, a dihydroflavonol analog; crombenin, a spiro-coumaranone; pubeschine, a catechin analog; fasciculiferin, a flavonol analog; the first 2,3-*cis*-peltogynol; and their putative precursors, α-hydroxychalcones and 2,3-*cis*- and 2,3-*trans*-3-0-methyl-dihydroflavonols. The wide distribution of these or their cyclized forms are relevant to the stereochemistry of flavan biogenesis.
- Isolation and synthesis of the first natural bi-isoflavonoids.