

ORDER TODAY!

CHEMICAL REVIEWS

"We are immensely pleased when we hear through the grapevine of students who keep a thematic issue like the holy writ on their laboratory bench."

—Josef Michl, Editor

Chemical Reviews is one of the most highly regarded and highest ranked journals covering the general topic of chemistry.

The mission of Chemical Reviews is to provide comprehensive, authoritative, critical, and readable reviews of important recent research in all areas of chemistry for authors located from all over the world.

In 1983 periodic thematic issues were instituted. These quasi-monographs have been well received and can be purchased for \$35 per issue. Listed below are the thematic issues dating back to 1995. They can be ordered individually, while supplies last, and represent real value to both the student and the professor of chemistry.

Please send me the following thematic issues:

- | | | | |
|--|--|--|--|
| <input type="checkbox"/> 2009 • Volume 109 | <input type="checkbox"/> Structure and Chemistry at Aqueous Interfaces | <input type="checkbox"/> Water | <input type="checkbox"/> Medicinal Inorganic Chemistry |
| <input type="checkbox"/> Degradation | <input type="checkbox"/> DNA Damage and Repair | <input type="checkbox"/> Frontiers in Landfill Chemistry | <input type="checkbox"/> Nanostructures |
| <input type="checkbox"/> Functional Synthesis | <input type="checkbox"/> 2005 • Volume 95 | <input type="checkbox"/> Nitric Oxide Chemistry | <input type="checkbox"/> Diatomaceous Earths |
| <input type="checkbox"/> Bioconjugation | <input type="checkbox"/> Natural Product Synthesis | <input type="checkbox"/> Glycolysis | <input type="checkbox"/> Supercritical Fluids |
| <input type="checkbox"/> Storage Metals in Organic Synthesis | <input type="checkbox"/> Defunctionalization—Pi and Sigma | <input type="checkbox"/> 2001 • Volume 81E | <input type="checkbox"/> 1998 • Volume 98 |
| <input type="checkbox"/> Molecular and Biomolecular Electrochemistry | <input type="checkbox"/> Inorganic and Bioinorganic Mechanisms | <input type="checkbox"/> Frontiers in Polymer Chemistry | <input type="checkbox"/> Cyclodextrins |
| <input type="checkbox"/> Chemical Approaches to Nanobiology | <input type="checkbox"/> Functional Nanostructures | <input type="checkbox"/> Protein Design | <input type="checkbox"/> RNA/DNA Cleavage |
| <input type="checkbox"/> Modern Topics in Classical Sensing | <input type="checkbox"/> Anticancer Resistance | <input type="checkbox"/> Protein Phosphorylation and Signaling | <input type="checkbox"/> Polysaccharides |
| <input type="checkbox"/> 2007 • Volume 107 | <input type="checkbox"/> 2004 • Volume 104 | <input type="checkbox"/> X-ray in Chemistry | <input type="checkbox"/> 1997 • Volume 97 |
| <input type="checkbox"/> Organocatalysis | <input type="checkbox"/> Molecular Graphenes | <input type="checkbox"/> Aromaticity | <input type="checkbox"/> Polyols & Nucleosides |
| <input type="checkbox"/> Hydrogen | <input type="checkbox"/> Nanoparticles and Nanotubes | <input type="checkbox"/> Frontiers in Mass Spectrometry | <input type="checkbox"/> Polymers |
| <input type="checkbox"/> Advances in Genomics and Proteomics | <input type="checkbox"/> Biological Neutron Magnetic Resonance | <input type="checkbox"/> 2000 • Volume 100 | <input type="checkbox"/> Microscopy |
| <input type="checkbox"/> Green Chemistry | <input type="checkbox"/> Heterocycles | <input type="checkbox"/> Frontiers in Carbohydrate Research | <input type="checkbox"/> Carbohydrate Chemistry |
| <input type="checkbox"/> Organic Electronics and Optoelectronics | <input type="checkbox"/> Immunocatalysis | <input type="checkbox"/> von der Waals III | <input type="checkbox"/> 1996 • Volume 96 |
| <input type="checkbox"/> Chemical Oceanography | <input type="checkbox"/> Biomedical, Inorganic Chemistry | <input type="checkbox"/> Organocatalysis in Organic Synthesis | <input type="checkbox"/> Heterogeneous Enzymology |
| <input type="checkbox"/> 2006 • Volume 106 | <input type="checkbox"/> 2003 • Volume 93 | <input type="checkbox"/> Chemical Sensors | <input type="checkbox"/> Surface Chemistry—Advances and Technological Impacts—1996 |
| <input type="checkbox"/> Designing the Molecular World | <input type="checkbox"/> Alkylphosphoranes—Long Term Issues | <input type="checkbox"/> Photochromic Monomers and Switches | <input type="checkbox"/> Frontiers in Organic Synthesis |
| <input type="checkbox"/> Photochemistry and Photophysics on Surfaces | <input type="checkbox"/> Heterogeneous Catalysis | <input type="checkbox"/> Frontiers in Metal-Catalyzed Polymerization | <input type="checkbox"/> 1995 • Volume 95 |
| <input type="checkbox"/> Principles of Bioprocess Catalysis | <input type="checkbox"/> Radical Enzymology | <input type="checkbox"/> Frontiers in Metal-Catalyzed Polymerization | <input type="checkbox"/> Synthesis of Biofunctional Molecules |
| <input type="checkbox"/> Process Chemistry | <input type="checkbox"/> Cyclopropanes and Related Rings | <input type="checkbox"/> Computational Theoretical Metal Chemistry | <input type="checkbox"/> Polymer Chemistry |
| <input type="checkbox"/> Protein Dynamics and Folding | <input type="checkbox"/> Laser Ablation of Molecular Solids | <input type="checkbox"/> 1999 • Volume 99 | <input type="checkbox"/> Heterogeneous Catalysis |
| | <input type="checkbox"/> 2002 • Volume 102 | <input type="checkbox"/> Chemical Analysis in Small Domains | <input type="checkbox"/> Environmental Chemistry |
| | <input type="checkbox"/> Proteases | | |
| | <input type="checkbox"/> Renewable Catalysts and Reagents | | |

Total number of issues: _____ @ \$35 each (ACS member) = \$ _____
 _____ @ \$45 each (ACS nonmember) = \$ _____
TOTAL \$ _____

METHOD OF PAYMENT Check (made payable to **American Chemical Society**)
 Credit Card Visa MasterCard AMEX
 Please Invoice me

Account No. _____ Exp. Date _____

Signature _____

*Payment in U.S. dollars and must include applicable taxes (print only) in CA, DC, MD, OH, IL. 7% Canadian GST for all orders shipped to Canada. Additional postage required for air service outside North America—\$22.00. Additional postage required for surface mail outside North America—\$8.00.

Name _____

ACS Member Number _____

Title _____

Organization _____

Address _____

Home Business

City _____ State/Province _____

Zip/Postal Code _____ Country _____

Phone _____ Email _____

For information about ACS member and institutional subscriptions, call 1-800-353-9511 (U.S. and Canada) or 614-447-3776.

(Please see <http://pubs.acs.org/CR> for a complete listing of all thematic issues)

ACS Publications
 American Chemical Society Sales & Marketing Department, attn: LR,
 1155 Sixteenth Street, N.W., Washington, D.C. 20036
 Or Mail to: Tel: 800-227-5058 x1554 (U.S. and Canada) or 202-872-4554

5967M



ACS Publications
 High quality. High impact.

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

August 12, 2009

JAFCAU 57(15) 6485-7158 (2009) ISSN 0021-8561
 Registered in the U.S. Patent and Trademark Office
 Copyright 2009 by the American Chemical Society

REVIEW

- 6485 **Interaction between Phenolics and Gut Microbiota: Role in Human Health**
*Maria V. Selma, Juan C. Espin, and Francisco A. Tomás-Barberán**

ANALYTICAL METHODS

- 6502 **Applicability of the Chymopapain Gene Used as Endogenous Reference Gene for Transgenic Huanong No. 1 Papaya Detection**
Jinzhao Guo, Litao Yang, Xin Liu, Haibo Zhang, Bingjun Qian, and Dabing Zhang**
- 6510 **Determination of Holo- and Apo-Riboflavin Binding Protein in Avian Egg Whites through Circular Dichroism and Fluorescence Spectroscopy**
*Giorgia Zandomenighi and Maurizio Zandomenighi**
- 6518 **Determination of Total Antioxidant Capacity of Commercial Beverage Samples by Capillary Electrophoresis via Inline Reaction with 2,6-Dichlorophenolindophenol**
*Emily T. Merola, Adam D. Catherman, Jenna B. Yehl, and Timothy G. Strein**
- 6524 **Determination by Fourier Transform Raman Spectroscopy of Conjugated Linoleic Acid in I₂-Photoisomerized Soybean Oil**
Bruno Bernuy, Marc Meurens, Eric Mignolet, Christine Turu, and Yvan Larondelle*
- 6528 **Application of Amperometric Biosensors for Analysis of Ethanol, Glucose, and Lactate in Wine**
Tatiana B. Gorushchikina, Alexey P. Soldatkin, and Sergei V. Dzyadevych*
- 6536 **Quantitative Screening of Stilbenes and Zeranol and Its Related Residues and Natural Precursors in Veal Liver by Gas Chromatography–Mass Spectrometry**
Leslie C. Dickson, Roderick Costain, Del McKenzie, Adrian C. E. Fesser, and James D. MacNeil*
- 6543 **Determination of Oxygen Heterocyclic Components in Citrus Products by HPLC with UV Detection**
Paola Dugo, Ama Piperno, Roberto Romeo, Maria Cambria, Marina Russo, Caterina Carnovale, and Luigi Mondello*
- 6552 **Simultaneous Determination of Five Bioactive Flavonoids in Pericarpium Citri Reticulatae from China by High-Performance Liquid Chromatography with Dual Wavelength Detection**
*GuoDong Zheng, DePo Yang, DongMei Wang, Fung Zhou, Xue Yang, and Lin Jiang**

- 6558 **Determination of Parathion in Vegetables by Electrochemical Sensor Based on Molecularly Imprinted Polyethyleneimine/Silica Gel Films**
Qinyan Yang, Qian Sun, Tianshu Zhou, Guoyue Shi,* and Litong Jin
- 6564 **Slurry Sampling Flow Injection Chemical Vapor Generation Inductively Coupled Plasma Mass Spectrometry for the Determination of As, Cd, and Hg in Cereals**
Feng-Yi Chen and Shih-Jen Jiang*
-
- BIOACTIVE CONSTITUENTS**
- 6570 **Comparative Analysis of Flavonoid Profile, Antioxidant and Antimicrobial Activity of the Berries of *Juniperus communis* L. var. *communis* and *Juniperus communis* L. var. *saxatilis* Pall. from Turkey**
Natalizia Miceli,* Ada Trovato, Paola Dugo, Francesco Cacciola, Paola Donato, Andreana Marino, Valentina Bellinghieri, Tommaso M. La Barbera, Aysegül Güvenc, and Maria F. Taviano
- 6578 **Changes in Antioxidant Endogenous Enzymes (Activity and Gene Expression Levels) after Repeated Red Wine Intake**
M. Soledad Fernández-Pachón, Genoveva Berná, Eduardo Otaolaarruchi, Ana M. Troncoso, Francisco Martín, and M. Carmen García-Parrilla*
- 6584 **Protectivity of Blue Honeysuckle Extract against Oxidative Human Endothelial Cells and Rat Hepatocyte Damage**
Irena Palíková, Kateřina Valentová,* Ivana Oborná, and Jitka Ulrichová
- 6590 **Tobacco Mosaic Virus (TMV) Inhibitors from *Picrasma quassoides* Benn**
Jia Chen, Xiao-Hui Yan, Jia-Hong Dong, Peng Sang, Xin Fang, Ying-Tong Di, Zhong-Kui Zhang, and Xiao-Jiang Hao*
- 6596 **Fumigant Antitermitic Activity of Plant Essential Oils and Components from Ajowan (*Trachyspermum ammi*), Allspice (*Pimenta dioica*), Caraway (*Carum carvi*), Dill (*Anethum graveolens*), Geranium (*Pelargonium graveolens*), and Litsea (*Litsea cubeba*) Oils against Japanese Termite (*Reticulitermes speratus* Kolbe)**
Seon-Mi Seo, Junheon Kim, Sang-Gil Lee, Chung-Hoon Shin, Sang-Chul Shin, and Il-Kwon Park*
- 6603 **Effect of High-Oxygen Atmospheres on the Antioxidant Potential of Fresh-Cut Tomatoes**
Isabel Odrizola-Serrano, Gemma Oms-Oliu, Robert Soliva-Fortuny, and Olga Martín-Belloso*
- 6611 **In Vitro Study of Red Clover Polyphenol Oxidase Activity, Activation, and Effect on Measured Lipase Activity and Lipolysis**
G. Van Ranst, V. Fievez,* M. Vandewalle, J. De Riek, and E. Van Bockstaele
- 6618 **Angiotensin I Converting Enzyme Inhibitory Peptides Produced by Autolysis Reactions from Wheat Bran**
Yoichi Nogata,* Takashi Nagamine, Mikiko Yanaka, and Hideaki Ohta
- 6623 **Antioxidant Effect and Active Components from Leaves of Lotus (*Nelumbo nucifera*)**
Hong-Yu Lin, Yueh-Hsiung Kuo,* Yun-Lian Lin,* and Wenchang Chiang*
- 6630 **Terpene-Mediated Parasitoid Host Location Behavior on Transgenic and Classically Bred Apple Genotypes**
Ute Vogler, Anja S. Rott, Cesare Gessler, and Silvia Dorn*
- 6636 **Protective Effects of the Essential Oil of *Salvia fruticosa* and Its Constituents on Astrocytic Susceptibility to Hydrogen Peroxide-Induced Cell Death**
Anat Elmann,* Sharon Mordechai, Miriam Rindner, Olga Larkov, Meital Elkabetz, and Uzi Ravid
- 6642 **Glycosylation of Dietary Flavonoids Decreases the Affinities for Plasma Protein**
Jianbo Xiao, Hui Cao, Yuanfeng Wang, Jinyao Zhao, and Xinlin Wei*
- 6649 **Chemical Components and Tyrosinase Inhibitors from the Twigs of *Artocarpus heterophyllus***
Zong-Ping Zheng, Sibao Chen, Shiyun Wang, Xiu-Chang Wang, Ka-Wing Cheng, Jia-Jun Wu, Dajiang Yang, and Mingfu Wang*
- 6656 **Alternethanoxins A and B, Polycyclic Ethanones Produced by *Alternaria sonchi*, Potential Mycoherbicides for *Sonchus arvensis* Biocontrol**
Antonio Evidente,* Biancavaleria Punzo, Anna Andolfi, Alexander Berestetskiy, and Andrea Motta
- 6661 **Anticoagulatory, Antiinflammatory, and Antioxidative Effects of Protocatechuic Acid in Diabetic Mice**
Chia-Yu Lin, Chin-Shiu Huang, Chun-Yin Huang, and Mei-Chin Yin*
- 6668 **Structural Properties of Anthocyanins: Rearrangement of C-Glycosyl-3-deoxyanthocyanidins in Acidic Aqueous Solutions**
Orjan Bjorøy, Saleh Rayyan, Torgils Fossen, and Øyvind M. Andersen*
- 6678 **Antioxidant Activity of the Dihydrochalcones Aspalathin and Nothofagin and Their Corresponding Flavones in Relation to Other Rooibos (*Aspalathus linearis*) Flavonoids, Epigallocatechin Gallate, and Trolox**
Petra W. Srijman, Elizabeth Joubert,* Daniel Ferreira, Xing-Cong Li, Yuanqing Ding, Ivan R. Green, and Wentzel C. A. Gelderblom
- 6685 **(-)-Epigallocatechin-3-gallate Induces Apoptosis of Human Hepatoma Cells by Mitochondrial Pathways Related to Reactive Oxygen Species**
WenJuan Li, ShaoPing Nie, Qiang Yu, and MingYong Xie*
- 6692 ***Panax notoginseng* Reduces Atherosclerotic Lesions in ApoE-Deficient Mice and Inhibits TNF- α -Induced Endothelial Adhesion Molecule Expression and Monocyte Adhesion**
Jian-Bo Wan, Simon Ming-Yuen Lee, Jing-Dong Wang, Nan Wang, Cheng-Wei He, Yi-Tao Wang,* and Jing X. Kang*
- 6696 **Engineering Flax with the GT Family 1 *Solanum soganandinum* Glycosyltransferase SsGT1 Confers Increased Resistance to *Fusarium* Infection**
Katarzyna Lorenc-Kukula, Magdalena Zuk, Anna Kubna, Magdalena Czemplik, Kamil Kostyn, Jacek Skala, Michał Starzycki, and Jan Szopa*
- 6706 **A Glycoprotein Extracted from Golden Oyster Mushroom *Pleurotus citrinipileatus* Exhibiting Growth Inhibitory Effect against U937 Leukemia Cells**
Jian-Nan Chen, Yuh-Tai Wang, and James Swi-Bea Wu*
- 6712 **Geranylated Flavonoids from the Roots of *Campylotropis hirtella* and Their Immunosuppressive Activities**
Qing-Yao Shou, Ran-Zhong Fu, Qing Tan, and Zheng-Wu Shen*
- 6720 **Molecular Binding of Catechins to Biomembranes: Relationship to Biological Activity**
Timothy W. Sirk, Eugene F. Brown, Mendel Friedman, and Amadeu K. Sim*

CHEMICAL ASPECTS OF BIOTECHNOLOGY/MOLECULAR BIOLOGY

- 6729 Preparation of Free-Standing Films from Kafirin Protein Microparticles: Mechanism of Formation and Functional Properties
Janet Taylor, John R. N. Taylor, Peter S. Belton, and Amanda Minnaar*
- 6736 Browning of Freeze-Dried Probiotic Bacteria Cultures in Relation to Loss of Viability during Storage
*Lone Kurtmann, Leif H. Skibsted, and Charlotte U. Carlsen**
- 6742 Purification and Characterization of a New Rhizopuspepsin from *Rhizopus oryzae* NBRC 4749
*Chun-Chang Chen, Yen-Ching Cho, Chien-Chen Lai, and Wen-Hwei Hsu**
- 6748 Synthesis and Characterization of a Structured Lipid from Amaranth Oil as a Partial Fat Substitute in Milk-Based Infant Formula
*Ashanty M. Pina-Rodriguez and Casimir C. Akoh**
- 6757 Determination of N-Glycosylation Site and Glycan Structures of Pectin Methyltransferase in Jelly Fig (*Ficus awkeotsang*) Achenes
*Eric S. L. Hsiao, Jeff C. F. Chen, Hsien-Yu Tsai, Kay-Hooi Khoo, Shui-Tein Chen, and Jason T. C. Tzen**

CHEMICAL ASPECTS OF FOOD SAFETY

- 6764 Characterization of Commercial Slovenian and Cypriot Fruit Juices Using Stable Isotopes
Nives Ogrinc, Karmen Bat, Iztok Jože Košir, Terezija Golob, and Rebecca Kokkinofa*

CHEMICAL CHANGES INDUCED BY PROCESSING/STORAGE

- 6770 Dealcoholized Wines by Spinning Cone Column Distillation: Phenolic Compounds and Antioxidant Activity Measured by the 1,1-Diphenyl-2-picrylhydrazyl Method
*Yulissa Y. Belisario-Sánchez, Amaury Taboada-Rodríguez, Fulgencio Marín-Iniesta, and Antonio López-Gómez**
- 6779 Quantitation of Chafuroside A and B in Tea Leaves and Isolation of Prechafuroside A and B from Oolong Tea Leaves
Hiroshi Ishida, Toshiyuki Wakimoto, Yukiko Kitao, Shimako Tanaka, Toshio Miyase, and Haruo Nakaya*
- 6787 Enzymatic Interesterification of Anhydrous Milk Fat with Rapeseed and/or Linseed Oil: Oxidative Stability
Jean-Michel Giet, Mario Aguedo, Sabine Danthine, Michel Paquot, Annick Thomas, Micheline Vandenberg, Philippe Thonart, Jean-Paul Wathélet, Christophe Blecker, and Georges Lognay*
- 6795 Volatile Constituents throughout *Brassica oleracea* L. Var. *acephala* Germination
Fátima Fernandes, Paula Guedes de Pinho, Patrícia Valentão, José A. Pereira, and Paula B. Andrade**
- 6803 Mechanism and Related Kinetics of 5-Methyltetrahydrofolic Acid Degradation during Combined High Hydrostatic Pressure–Thermal Treatments
*Philippe H. C. J. Verlinde, Indravati Oey, Wim M. Deborggraeve, Marc E. Hendrickx, and Ann M. Van Loey**

- 6815 Changes in Antioxidant Compounds during the Shelf Life of Commercial Tomato Juices in Different Packaging Materials
*Francisco J. García-Alonso, Sergio Bravo, Javier Casas, Dario Pérez-Conesa, Karin Jacob, and Maria J. Periago**
- 6823 Determining the Effect of Calcium Cations on Acrylamide Formation in Cooked Wheat Products Using a Model System
Robert A. Levine and Sean M. Ryan*
- 6830 Concomitant Changes in Viscoelastic Properties and Amorphous Polymers during the Hydrothermal Treatment of Hardwood and Softwood
Carole Assor, Vincent Placet, Brigitte Chabbert, Anouck Habrant, Catherine Lapiere, Brigitte Pollet, and Patrick Porré*
- 6838 Oxidation of the Dihydrochalcone Aspalathin Leads to Dimerization
*Nicole Krafczyk, Theres Heinrich, Andrea Porzel, and Marcus A. Glomb**
- 6844 Development of a High Methoxyl Pectin Edible Film for Retention of L-(+)-Ascorbic Acid
*Carolina D. Pérez, Silvia K. Flores, Alejandro G. Marangoni, Lia N. Gerschenson, and Ana M. Rojas**

CHEMICAL COMPOSITION OF FOODS/FEEDS

- 6856 Characterization and Quantification of Anthocyanins in Red Kiwifruit (*Actinidia* spp.)
Mirco Montefiori, Daniel J. Comeskey, Mark Wohlers, and Tony K. McGhie*
- 6862 Metabolomic Insight into Soy Sauce through ¹H NMR Spectroscopy
■ *Bong-Kuk Ko, Hyuk-Jin Ahn, Frans van den Berg, Cheri-Ho Lee,* and Young-Shick Hong**
- 6871 Fourier Transform Infrared Microspectroscopic Analysis of the Effects of Cereal Type and Variety within a Type of Grain on Structural Makeup in Relation to Rumen Degradation Kinetics
*Ananda M. Walker, Peiqiang Yu, Colleen R. Christensen, David A. Christensen, and John J. McKinnon**
- 6879 Chemical Characteristics of *Salvia miltiorrhiza* (Danshen) Collected from Different Locations in China
*Guo-Xin Zhong, Peng Li, Ling-Jiu Zeng, Jia Guan, De-Qiang Li, and Shao-Ping Li**
- 6888 Statistical Evaluation of Triacylglycerol Composition in Plant Oils Based on High-Performance Liquid Chromatography–Atmospheric Pressure Chemical Ionization Mass Spectrometry Data
■ *Miroslav Lisa, Michal Holcapek,* and Michal Bohác*
- 6899 Comparison of Gas Chromatography–Coupled Time-of-Flight Mass Spectrometry and ¹H Nuclear Magnetic Resonance Spectroscopy Metabolite Identification in White Wines from a Sensory Study Investigating Wine Body
■ *Kirsten Skogerson, Ron Runnebaum, Geri Wohlgenuth, Jeffrey de Ropp, Hildegard Heymann, and Oliver Fiehn**

CROP AND ANIMAL PROTECTION CHEMISTRY

- 6908 Blocking of *Pseudomonas aeruginosa* and *Ralstonia solanacearum* Lectins by Plant and Microbial Branched Polysaccharides Used as Food Additives
*Keren D. Zinger-Yosovitch and Nechama Gilboa-Garber**

- 6914 ■ **Determination of Stereoselective Interaction between Enantiomers of Chiral γ -Aryl-1*H*-1,2,4-triazole Derivatives and *Penicillium digitatum***
Xiaofang Cao, Ming Hu, Jie Zhang, Fei Li, Yuhong Yang, Deli Liu,* and Sheng Hua Liu*
- 6920 **Stereoisomeric Separation and Bioassay of a New Organophosphorus Compound, *O,S*-Dimethyl-*N*-(2,2,2-trichloro-1-methoxyethyl)phosphoramidothioate: Some Implications for Chiral Switch**
Shanshan Zhou, Lumei Wang, Ling Li, and Weiping Liu*

ENVIRONMENTAL CHEMISTRY

- 6927 ■ **Separation of Phthalocyanine-like Substances from Humic Acids Using a Molecular Imprinting Method and Their Photochemical Activity under Simulated Sunlight Irradiation**
Chunyan Yu, Shao Chen, Xie Quan,* Xiaoxia Ou, and Yaohui Zhang
- 6932 ■ **Photolysis of Chlortetracycline on a Clay Surface**
Jeffrey J. Werner, Kristopher McNeill,* and William A. Arnold*
- 6938 **Epimerization of Cypermethrin Stereoisomers in Alcohols**
Mae Grace Nillos, Sujie Qin, Cynthia Larive, Daniel Schlenk, and Jay Gan*
- 6944 **Removal of Simazine in a UV/TiO₂ Heterogeneous System**
Wei Chu,* Yongfang Rao, and W. Y. Hui
- 6950 **Tracing and Quantifying Sources of Fatty Acids and Steroids in Amended Cultivated Soils**
Emilie Jardé,* Gérard Gruau, and Anne Jaffrezic
- 6957 **Horseweed with Reduced Susceptibility to Glyphosate Found in the Czech Republic**
Daniela Chodová, Jaroslav Salava, Olga Martincová, and Milena Cvikrová*

FLAVORS AND AROMAS/CHEMOSENSORY PERCEPTION

- 6962 **Characterization and Antioxidant Activity of Essential Oils from Fresh and Decaying Leaves of *Eucalyptus tereticornis***
Harminder P. Singh,* Sunil Mittal, Shalinder Kaur, Daizy R. Batish, and Ravinder K. Kohli
- 6967 **Interaction of Copper and Human Salivary Proteins**
Jae Hee Hong,* Susan E. Duncan, Andrea M. Dietrich, Sean F. O'Keefe, William N. Eigel, and Kumar Mallikarjunan
- 6976 **Aroma Release from Wines under Dynamic Conditions**
Maroussa Tsachaki,* Robert S. T. Linforth, and Andrew J. Taylor
- 6982 **Application of Separated Leaf Cell Suspension to Xenobiotic Metabolism in Plant**
Takuo Fujisawa,* Yoshihide Matsuba, and Toshiyuki Katagi

FOOD CHEMISTRY/BIOCHEMISTRY

- 6990 **Evaluation of *Azadirachta indica* Leaf Fractions for in Vitro Antioxidant Potential and Protective Effects against H₂O₂-Induced Oxidative Damage to pBR322 DNA and Red Blood Cells**
P. Manikandan, R. Anandan, and S. Nagini*

- 6997 ■ **Gel-Based Proteomics Approach to the Study of Metabolic Changes in Pear Tissue during Storage**
Romina Pedreschi,* Maarten Hertog, Johan Robben, Kathryn S. Lilley, Natasha A. Karp, Geert Buggeman, Jozef Vanderleyden, and Bart Nicolai
- 7005 **Autoclave and β -Amylolytic Lead to Reduced in Vitro Digestibility of Starch**
B. Elliot Hickman, Srinivas Janaswamy, and Yuan Yao*
- 7013 **Involvement of Methemoglobin (MetHb) Formation and Hemin Loss in the Pro-oxidant Activity of Fish Hemoglobins**
Rodrigo Maestre, Manuel Pazos,* and Isabel Medina
- 7022 **Purification and Characterization of a Kunitz-Type Trypsin Inhibitor from *Acacia victoriae* Benthham Seeds**
Kah Y. Ee, Jian Zhao, Ata-ur Rehman, and Samson O. Agboola*
- 7030 **Dough Rheology and Wet Milling of Hard Waxy Wheat Flours**
Lan Guan, Paul A. Selb, Robert A. Graybosch, Scott Bean, and Yong-Cheng Shi*
- 7039 **Spatial and Temporal Analysis of Textural and Biochemical Changes of Imported Avocado cv. Hass during Fruit Ripening**
Sandra Landahl, Marjolaine Dorothée Meyer, and Leon Alexander Terry*
- 7048 **Effect of Irrigation on Quality Attributes of Olive Oil**
Evagelia Stefanoudaki,* Mark Williams, Kostas Chartzoulakis, and John Harwood
- 7056 **Influence of Postharvest Treatments on Quality, Carotenoids, and Abscisic Acid Content of Stored "Spring Belle" Peach (*Prunus persica*) Fruit**
Ivano Caprioli, Maria T. Lafuente, Maria J. Rodrigo, and Fabio Mencarelli*
- 7064 **Changes in Cell Wall Composition Associated to the Softening of Ripening Papaya: Evidence of Extensive Solubilization of Large Molecular Mass Galacturonides**
Tânia Mizuzu Shiga, João Paulo Fabi, João Roberto Oliveira do Nascimento, Carmen Lúcia de Oliveira Petkowicz, Lúcia Cristina Vriesmann, Franco Maria Lajolo, and Beatriz Rosana Cordenunsi*
- 7072 **Effects of Selected Organo-sulfur Compounds on Melanin Formation**
Hwey-Ling Chu, Bor-Sen Wang, and Pin-Der Duh*
- 7078 **Effect of Enzymatic Mash Treatment and Storage on Phenolic Composition, Antioxidant Activity, and Turbidity of Cloudy Apple Juice**
Jan Oszmiański,* Aneta Wojdyło, and Joanna Kobiak
- 7086 **A β -Galactosidase from Pea Seeds (*P*:BGAL): Purification, Stabilization, Catalytic Energetics, Conformational Heterogeneity, and Its Significance**
Alka Dwevedi and Arvind M. Kayastha*
- 7097 **Trypsin from the Pyloric Ceca of Pectoral Rattail (*Coryphaenoides pectoralis*): Purification and Characterization**
Sappasith Klomklao,* Hideki Kishimura, and Sootawat Benjakul
- 7104 **Bioavailability of C-Linked Dihydrochalcone and Flavanone Glucosides in Humans Following Ingestion of Unfermented and Fermented Rooibos Teas**
Angélique Stalmach, William Mullen, Monia Pecorari, Mauro Serafini, and Alan Crozier*

- 7112 **Prooxidant Mechanisms of Free Fatty Acids in Stripped Soybean Oil-in-Water Emulsions**
*Thaddaeo Waraho, Vladimiro Cardenia, Maria T. Rodriguez-Estrada, D. Julian McClements, and Eric A. Decker**
- 7118 **Baicalin in Radical Scavenging and Its Synergistic Effect with β -Carotene in Antilipoxidation**
Ran Liang, Rui-Min Han, Li-Min Fu, Xi-Cheng Ai, Jian-Ping Zhang, and Leif H. Skibsted**
- 7125 **Delivery of Bioactive Conjugated Linoleic Acid with Self-Assembled Amylose-CLA Complex**
*Ying Yang, Zhengbiao Gu, and Genyi Zhang**

MOLECULAR NUTRITION

- 7131 **Black-Tea Polyphenols Suppress Postprandial Hypertriglycerolemia by Suppressing Lymphatic Transport of Dietary Fat in Rats**
Makoto Kobayashi, Masaki Ichitani, Yuko Suzuki, Tomonori Unno, Takashi Sugawara, Takashi Yamahira, Masaki Kato, Takano Takihara, Yuko Sagesaka, Takami Kakuda, and Ikuo Ikeda*
- 7137 **Freshly Crushed Garlic is a Superior Cardioprotective Agent than Processed Garlic**
*Subhendu Mukherjee, Istvan Lekli, Shyamal Goswami, and Dipak K. Das**

TOXICOLOGY IN AGRICULTURE AND FOOD

- 7145 **Tolerance and Stress Response of *Macrolepiota procera* to Nickel**
Paula Baptista, Silvia Ferreira, Elisa Soares, Valentim Coelho, and Maria de Lourdes Bastos*
- 7153 **QSPR Modeling of Soil Sorption Coefficients (K_{oc}) of Pesticides Using SPA-ANN and SPA-MLR**
Nasser Goudarzi, Mohammad Goudarzi, Mario Cesar Ugulino Araujo, and Roberto Kawakami Harrop Galvão*

■ Supporting Information is available free of charge via the Internet at <http://pubs.acs.org>.

* In papers with more than one author, the asterisk indicates the name of the author to whom inquiries about the paper should be addressed.

Visit the Web Current ACS Ethical Guidelines to Publication of Chemical Research and other information for authors and reviewers, including guidelines for manuscript preparation and copyright forms, can be found on the Web at the Author & Reviewer Resource Center at <http://pubs.acs.org/page/4/authors/index.html>.

Interaction between Phenolics and Gut Microbiota: Role in Human Health

MARIA V. SELMA, JUAN C. ESPIN, AND FRANCISCO A. TOMÁS-BARBERÁN*

Research Group on Quality, Safety and Bioactivity of Plant Foods, Department of Food Science and Technology, CEBAS-CSIC, Murcia, Spain

Dietary phenolic compounds are often transformed before absorption. This transformation modulates their biological activity. Different studies have been carried out to understand gut microbiota transformations of particular polyphenol types and identify the responsible microorganisms. Although there are potentially thousands of different phenolic compounds in the diet, they are typically transformed to a much smaller number of metabolites. The aim of this review was to discuss the current information about the microbial degradation metabolites obtained from different phenolics and their formation pathways, identifying their differences and similarities. The modulation of gut microbial population by phenolics was also reviewed in order to understand the two-way phenolic-microbiota interaction. *Clostridium* and *Eubacterium* genera, which are phylogenetically associated, are other common elements involved in the metabolism of many phenolics. The health benefits from phenolic consumption should be attributed to their bioactive metabolites and also to the modulation of the intestinal bacterial population.

KEYWORDS: *Eubacterium*; *Clostridium*; polyphenols; phenolics; flavonoids; tannins; human metabolism; gut microflora; microbial metabolism; bioavailability

INTRODUCTION

Phenolic compounds are currently receiving much attention because of their beneficial health effects related to their antioxidant, anti-inflammatory, antiestrogenic, cardioprotective, cancer chemopreventive, and neuroprotective properties (1-6). Most dietary polyphenols are transformed in the colon by the intestinal microbiota before absorption. This conversion is often essential for absorption and modulates the biological activity of these dietary compounds (7, 8). Furthermore, dietary polyphenols are substrates for several enzymes located in the small intestine and colon and in the liver (hydrolyzing and conjugating enzymes) (9-16). Therefore, the colon has to be considered as an active site for metabolism rather than a simple excretion route and deserves further attention from the scientific community (17). Recent studies have investigated the relevance of the intestinal microbial activation of polyphenols in human health.

Gut bacteria can hydrolyze glycosides, glucuronides, sulfates, amides, esters, and lactones. They also carry out ring-cleavage, reduction, decarboxylation, demethylation, and dehydroxylation reactions (17-19). The hydrolysis of glycosides results in metabolites that are potentially more biologically active than the parent compounds. Further bacterial transformation of aglycones can lead to production of more or less active compounds, depending on the substrate being metabolized and the products formed (18, 19). Several studies have been carried out to understand the transformations of particular polyphenol types and to

identify the microorganisms involved during their colonic fermentation, which varies depending on the chemical structure.

On the other hand, phenolic compounds are also antimicrobial and can interact with the gut microbiota, producing a modulation of the microbial population of the gastrointestinal (GI) tract. This has effects on GI health and also in the metabolism of dietary phenolics (20, 21).

The aim of this review was to summarize the current information about the microbial degradation metabolites and their formation pathways obtained from the different groups of dietary phenolic compounds, identifying their differences and similarities. The modulation of gut microbial population by phenolics has also been reviewed in order to understand the two-way phenolic-microbiota interaction. Recent progress in the identification of colonic microbial species responsible for phenolic metabolism and novel tools used to identify them and the effects of polyphenol microbial metabolism on their bioavailability and bioactivity were also reviewed.

MICROBIAL METABOLIC PATHWAYS AND METABOLITES OF THE DIETARY PHENOLIC COMPOUNDS

In nature, phenolics are usually found conjugated to sugars and organic acids and can be classified into two major types: flavonoid and nonflavonoid phenolics. All flavonoid phenolics share a basic structure consisting of two benzene rings (A and B) linked through a heterocyclic pyrone C ring (Figure 1). In contrast, nonflavonoid phenolics include a more heterogeneous group of compounds (Figure 2) including from the simplest of the class such as C_6-C_1 benzoic acids and C_6-C_1 hydroxycinnamates to

* Author to whom correspondence should be addressed (e-mail fatomas@cebas.csic.es).