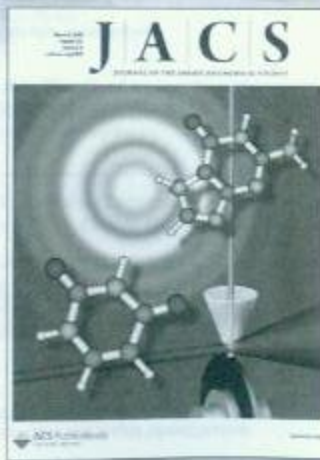


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REVIEWS

- 6543 **Nutritional, Biochemical, and Pharmaceutical Potential of Proteins and Peptides from *Jatropha*: Review**
Rakshit K. Devappa, Harinder P. S. Makkar, and Klaus Becker*

ANALYTICAL METHODS

- 6556 **Selective Differentiation of Indoleacetic Acid and Indolebutyric Acid Using Colorimetric Recognition after Ehrlich Reaction**
*Jun-Min Guo, You-Ying Xin, and Xue-Bo Yin**
- 6562 **Fast and Simple Nuclear Magnetic Resonance Method To Measure Conjugated Linoleic Acid in Beef**
Roberta Manzano Maria, Luiz Alberto Cobnago, Lucimara Aparecida Forato, and Donald Bouchard*
- 6565 **Magnetic Levitation in the Analysis of Foods and Water**
*Katherine A. Mirica, Scott T. Phillips, Charles R. Mace, and George M. Whitesides**
- 6570 **Rapid and Simple Micromethod for the Simultaneous Determination of 3-MCPD and 3-MCPD Esters in Different Foodstuffs**
Markus Küsters, Ute Bimber, Alexandra Ossenhüßgen, Sebastian Reeser, Rainer Gallitzendörfer, and Michael Gerhartz*
- 6578 **Optimization of a Method for the Extraction and Quantification of Carotenoids and Chlorophylls during Ripening in Grape Berries (*Vitis vinifera* cv. Merlot)**
*Zsolt Kamffer, Keren A. Bindon, and Anita Oberholster**
- 6587 **Immunochemical Detection of Tissue from the Central Nervous System via Myelin Proteolipid Protein: Adaptation for Food Inspection and Development of Recombinant Bivalent Fab Mini-Antibodies**
*Ingrid Weigel, Gesine Schulze, and Monika Fischetsrieder**
- 6594 **Ultra-low Flow Liquid Chromatography Assay with Ultraviolet (UV) Detection for Piperine Quantitation in Human Plasma**
Madhuri Kakarala, Shiv Kumar Dubey, Malgorze Turnowski, Connie Cheng, Samadhi Liyanage, Terrence Strawder, Karim Tazi, Ananda Sen, Zora Djuric, and Dean E. Bremner*

- 6600 **Simultaneous Multiplex Detection and Confirmation of the Proteineaceous Toxins Abrin, Ricin, Botulinum Toxins, and Staphylococcus Enterotoxins A, B, and C in Food**
Eric A. E. Garber, Kodumudi V. Venkateswaran, and Thomas W. O'Brien*
- 6608 **Inhibition of Three Selected Beverage Extracts on α -Glucosidase and Rapid Identification of Their Active Compounds Using HPLC-DAD-MS/MS and Biochemical Detection**
*De-Qiang Li, Zheng-Ming Qian, and Shao-Ping Li**
- 6614 **Determination of F₂-Isoprostanes in Urine by Online Solid Phase Extraction Coupled to Liquid Chromatography with Tandem Mass Spectrometry**
*Marsha L. Langhorst, Michael J. Hastings, Wallace H. Yokoyama, Shao-Ching Hung, Nicholas Cellar, Krishna Kuppannan, and Scott A. Young**

BIOACTIVE CONSTITUENTS

- 6621 **Cellular Antioxidant Activity of Common Vegetables**
*Wei Song, Christopher M. Derito, M. Keshu Liu, Xiangju He, Mei Dong, and Rui Hai Liu**
- 6630 **Aqueous Garlic Extracts Prevent Oxidative Stress and Vascular Remodeling in an Experimental Model of Metabolic Syndrome**
*Marcela Alejandra Vazquez-Prieto, Roxana Elizabeth González, Nicolás Federico Renna, Claudin Rómulo Galmarini, and Roberto Miguel Miatello**
- 6636 **Polyphenolic Apple Extracts: Effects of Raw Material and Production Method on Antioxidant Effectiveness and Reduction of DNA Damage in Caco-2 Cells**
*Phillip Bellon, Jasmin Digles, Frank Will, Helmut Dietrich, Matthias Baum, Gerhard Eisenbrand, and Christine Janzowski**
- 6643 **Betulinic Acid Stimulates the Differentiation and Mineralization of Osteoblastic MC3T3-E1 Cells: Involvement of BMP/Runx2 and β -Catenin Signals**
Yi-Chen Lo, Yu-Han Chang, Bai-Lu Wei, Yu-Ling Huang, and Wen-Fei Chiau**
- 6650 **Highly Variable Contents of Phenolics in St. John's Wort Products Affect Their Transport in the Human Intestinal Caco-2 Cell Model: Pharmaceutical and Biopharmaceutical Rationale for Product Standardization**
*Song Gao, Wen Jiang, Taijun Yin, and Ming Hu**
- 6660 **Protection of Fibroblasts (NIH-3T3) against Oxidative Damage by Cyanidin-3-rhamnoglucoside Isolated from Fig Fruits (*Ficus carica* L.)**
Anat Solomon, Sara Golubowicz, Zeev Yablowicz, Margalit Bergman, Shlomo Grossman, Arie Altman, Zohar Kerem, and Moshe A. Flatsman*
- 6666 **Comparison of Absorption of 1-Deoxyxojirimycin from Mulberry Water Extract in Rats**
*Ji Yeon Kim, Hye Jin Kwon, Ji Young Jung, Hye Young Kwon, Jin Gyeong Back, Young-Suk Kim, and Oran Kwon**
- 6672 **Analysis and Anti-*Helicobacter* Activity of Sulforaphane and Related Compounds Present in Broccoli (*Brassica oleracea* L.) Sprouts**
*Joon-Kwan Moon, Jun-Ran Kim, Young-Joon Ahn, and Takayuki Shibamoto**

- 6678 **Enterodiol and Enterolactone Modulate the Immune Response by Acting on Nuclear Factor- κ B (NF- κ B) Signaling**
Emanuela Corsini, Mario Dell'Agli, Alessandra Facchi, Emma De Fabiani, Laura Lucchi, Maria Serena Boraso, Marina Marinovich, and Corrado L. Galli*
- 6685 **Chocolate Matrix Factors Modulate the Pharmacokinetic Behavior of Cocoa Flavan-3-ol Phase II Metabolites Following Oral Consumption by Sprague-Dawley Rats**
*Andrew P. Neilson, Teryn N. Sapper, Elsa M. Janie, Ralf Rudolph, Nathan V. Matusheski, and Mario G. Ferruzzi**
- 6692 **Beneficial Effects of Cinnamon Proanthocyanidins on the Formation of Specific Advanced Glycation Endproducts and Methylglyoxal-Induced Impairment on Glucose Consumption**
*Xiaofang Peng, Jinyu Ma, Jianfei Chao, Zheng Sun, Raymond Chuen-Chung Chang, Iris Tse, Edmund T. S. Li, Feng Chen, and Mingfu Wang**
- 6697 **Characterization of Low Molecular Weight Chemical Fractions of Dry Bean (*Phaseolus vulgaris*) for Bioactivity Using *Caenorhabditis elegans* Longevity and Metabolite Fingerprinting**
*Meghan M. Mensack, Vanessa K. Fitzgerald, Matthew R. Lewis, and Henry J. Thompson**
- 6706 **Content of Insoluble Bound Phenolics in Millets and Their Contribution to Antioxidant Capacity**
*Anoma Chandrasekara and Fereidoon Shahidi**
- 6715 **Protection of *Monascus*-Fermented *Dioscorea* against DMBA-Induced Oral Injury in Hamster by Anti-inflammatory and Antioxidative Potentials**
*Wei-Hsuan Hsu, Bao-Hong Lee, and Tzu-Ming Pan**
- 6721 **Antihypertensive Properties of Lactoferricin B-Derived Peptides**
*Pedro Ruiz-Giménez, Aida Ibañez, Juan B. Salom, Jose F. Marcos, Jose Javier López-Diez, Salvador Vallès, Germán Torregrosa, Enrique Alborch, and Paloma Manzanares**

- 6728 **Novel Technology for the Preparation of Self-Assembled Catechin/Gelatin Nanoparticles and Their Characterization**
Yu-Chi Chen, Shu-Huei Yu, Guo-Jane Tsai, Del-Wei Tang, Fwu-Long Mi, and Yu-Ping Peng*

- 6735 **Antihypertensive Effects of Silk Fibroin Hydrolysate by Alcalase and Purification of an ACE Inhibitory Dipeptide**
*Fengjuan Zhou, Zhaohui Xue, and Jiehua Wang**

CHEMICAL ASPECTS OF BIOTECHNOLOGY/MOLECULAR BIOLOGY

- 6741 **Immobilization of Cellulase on a Reversibly Soluble-Insoluble Support: Properties and Application**
*Jianqin Zhou**
- 6747 **Urea Degradation in Some White Wines by Immobilized Acid Urease in a Stirred Bioreactor**
*Lucia Andrich, Marco Esti, and Mauro Moresi**

- 6754 Structures of Two Novel Trimeric Stilbenes Obtained by Horseradish Peroxidase Catalyzed Biotransformation of *trans*-Resveratrol and (-)-*c*-Viniferin
*Andrea Wilkens, Jana Paulsen, Victor Wray, and Peter Winterhalter**
- 6762 Genetic Engineering of *Stenotrophomonas* Strain YC-1 To Possess a Broader Substrate Range for Organophosphates
Chao Yang, Cunjiang Song, Ashok Mulchandani, and Chuanling Qiao**
- 6767 Uptake, Translocation, and Remobilization of Zinc Absorbed at Different Growth Stages by Rice Genotypes of Different Zn Densities
Chun-yong Wu, Ling-li Lu, Xiao-e Yang, Ying Feng, Yan-yan Wei, Hu-lin Hao, P. J. Stoffella, and Zhen-li He*

CHEMICAL ASPECTS OF FOOD SAFETY

- 6774 Tissue Depletion and Concentration Correlations between Edible Tissues and Biological Fluids of 3-Amino-2-oxazolidinone in Pigs Fed with a Furazolidone-Medicated Feed
*Yu Liu, Lingli Huang, Yulian Wang, Bo Yang, Awaiz Ishaq, Ke Fang, Dapeng Peng, Zhenli Liu, Menghong Dai, and Zonghui Yuan**
- 6780 Active Paraffin-Based Paper Packaging for Extending the Shelf Life of Cherry Tomatoes
Angel Rodriguez-Lafuente, Cristina Nerin, and Ramon Batlle*

CHEMICAL CHANGES INDUCED BY PROCESSING/STORAGE

- 6787 Pilot-Scale Resin Adsorption as a Means To Recover and Fractionate Apple Polyphenols
Dietmar R. Kammerer, Reinhold Carle, Roger A. Stanley, and Zaid S. Saleh*
- 6797 Influence of Prefermentative Cold Maceration on the Color and Anthocyanic Copigmentation of Organic Tempranillo Wines Elaborated in a Warm Climate
*Belen Gordillo, M. Isabel López-Infante, Pilar Ramirez-Pérez, M. Lourdes González-Miré, and Francisco J. Heredia**
- 6804 Prestorage Oxalic Acid Treatment Maintained Visual Quality, Bioactive Compounds, and Antioxidant Potential of Pomegranate after Long-Term Storage at 2 °C
*Mohammad Sayyari, Daniel Valero, Mesbah Babalar, Siannak Kalantari, Pedro J. Zapata, and Maria Serrano**
- 6809 Chemical Modification of Gelatin by a Natural Phenolic Cross-linker, Tannic Acid
Xiaoqing Zhang, My Dieu Do, Philip Casey, Adrian Sulistio, Greg G. Qiao, Leif Lundin, Peter Lillford, and Shanthy Kosaraju*
- 6816 β -Carotene Isomerization Kinetics during Thermal Treatments of Carrot Purée
*Lien Lemmens, Kristel De Vleeschouwer, Katrijn R. N. Moelants, Ines J. P. Colle, Ann M. Van Loey, and Marc E. Hendricks**
- 6825 Gelling Properties of Microparticulated Whey Proteins
*Muditha Dissanayake, Alan L. Kelly, and Todor Vasiljevic**

CHEMICAL COMPOSITION OF FOODS/FEEDS

- 6833 Effects of Organic and Conventional Cultivation Methods on Composition of Eggplant Fruits
*Maria D. Raigón, Adrián Rodríguez-Burruezo, and Jaime Prohens**

- 6841 Timing of Cluster Light Environment Manipulation during Grape Development Affects C₁₃ Norisoprenoid and Carotenoid Concentrations in Riesling
*Misha T. Kwaniewski, Justine E. Vanden Heuvel, Bruce S. Pan, and Gavin L. Sacks**
- 6850 Phenolic Component Profiles of Mustard Greens, Yu Choy, and 15 Other Brassica Vegetables
Long-Ze Lin and James M. Harnly*

CROP AND ANIMAL PROTECTION CHEMISTRY

- 6858 Design, Synthesis, and Insecticidal Activities of Phthalamides Containing a Hydrazone Substructure
Ming Liu, Yi Wang, Wei-zi Wangyang, Feng Liu, Yong-liang Cui, You-sheng Duan, Min Wang, Shang-zhong Liu, and Chang-hui Rui**

ENVIRONMENTAL CHEMISTRY

- 6864 Metsulfuron-methyl Sorption/Desorption Behavior on Volcanic Ash-Derived Soils. Effect of Phosphate and pH
*Lizethly Cáceres, Roxana Fuentes, Mauricio Escudey, Edgar Fuentes, and Maria E. Báez**
- 6870 Effect of Particle Size on Copper Oxychloride Transport through Saturated Sand Columns
Marcos Paradelo, Paula Pérez-Rodríguez, Mamei Arias-Estévez, and J. Eugenio López-Periago*
- 6876 Inorganic Contaminants in Bee Pollen from Southeastern Brazil
Marcelo A. Morgano, Marcia C. Teixeira Martins, Luana C. Rabonato, Raquel F. Milani, Katumi Yotsuyanagi, and Delia B. Rodriguez-Amaya*
- 6884 Nanobiocomposites of Carrageenan, Zein, and Mica of Interest in Food Packaging and Coating Applications
*Maria D. Sanchez-Garcia, Lucie Hilliou, and Jose M. Lagaron**
- 6895 Oxidative Removal and Kinetics of Fipronil in Various Oxidation Systems for Drinking Water Treatment
*Evelyn F. Chamberlain, Chuan Wang, Honglan Shi, Craig D. Adams, and Yinfa Ma**

FLAVORS AND AROMAS/CHEMOSENSORY PERCEPTION

- 6900 Evaluation of the Active Odorants in Amontillado Sherry Wines during the Aging Process
Lourdes Moyano, Luis Zea, Jose A. Moreno, and Manuel Medina*
- 6905 Effect of Fat Content on Flavor Delivery during Consumption: an in Vivo Model
Rob Linforth, Magalie Cabannes, Louise Hewson, Nicole Yang, and Andrew Taylor*

FOOD CHEMISTRY/BIOCHEMISTRY

- 6912 Changes in Protein Expression Profiles between a Low Phytic Acid Rice (*Oryza sativa* L. Ssp. *japonica*) Line and Its Parental Line: A Proteomic and Bioinformatic Approach
*Kaveh Emami, Nicholas J. Morris, Simon J. Cockell, Gabriela Golebiowska, Qing-Yao Shu, and Angharad M. R. Gatehouse**

- 6923 **Changes in Mucosal α -Glucosidase Activities along the Jejunal–Ileal Axis by an Hm-HACS Diet Intake Are Associated with Decreased Lipogenic Enzyme Activity in Epididymal Adipose Tissue**
*Kazuki Mochizuki, Yuki Sato, Sachiko Takase, and Toshinao Goda**
- 6928 **Quality Traits of Conventional and Transgenic Lettuce (*Lactuca sativa* L.) at Harvesting by NMR Metabolic Profiling**
Anatoly P. Sobolev, Giulio Testone, Flavio Santoro, Chiara Nicolodi, Maria A. Iannelli, Maria E. Amato, Antonietta Ianniello, Elvino Brosio, Donato Giannino, and Luisa Mannina**
- 6937 **Synthesis and Antioxidant Activity of Hydroxycinnamic Acid Xylan Esters**
Pauli Wrigstedt, Petri Kylli, Leena Pitkänen, Paula Nousiainen, Maija Tenkanen, and Jussi Sipilä*
- 6944 **Stability of Carotenoids in *Scenedesmus almeriensis* Biomass and Extracts under Various Storage Conditions**
Maria del Carmen Cerón-García, Inmaculada Campos-Pérez, María Dolores Macías-Sánchez, Ruperto Bermejo-Román, José M. Fernández-Sevilla, and Emilio Molina-Grima*
- 6951 **Growth, Yield, and Fruit Quality of Pepper Plants Amended with Two Sanitized Sewage Sludges**
Inmaculada Pascual, Iñaki Azcona, Ione Aguirreola, Fermín Morales, Francisco Javier Corpas, José Manuel Palma, Rubén Rellán-Álvarez, and Manuel Sánchez-Díaz*
- 6960 **The Bioavailable Octapeptide Gly-Ala-Hyp-Gly-Leu-Hyp-Gly-Pro Stimulates Nitric Oxide Synthesis in Vascular Endothelial Cells**
Kazuo Shimizu, Mikako Sato, Youzuo Zhang, Tomomi Kouguchi, Yoshihisa Takahata, Fumiki Morimatsu, and Makoto Shimizu*
- 6966 **Chemical Composition and Antioxidant Activities of *Russula griseocarnosa* sp. nov.**
Xin-Hua Chen, Le-Xian Xia, Hong-Bo Zhou, and Guan-Zhou Qiu*
- 6972 **Evolution of Sesquiterpene Hydrocarbons in Virgin Olive Oil during Fruit Ripening**
Stefania Vichi, Alda Lazzet, Nazihra Grafi Kamoun, Elvira López-Tamames, and Susana Buxaderas*
- 6977 **Microencapsulation by Spray-Drying of Anthocyanin Pigments from Corozo (*Bactris guineensis*) Fruit**
Coralia Osorio, Baudilio Acevedo, Silke Hillebrand, José Carriazo, Peter Winterhalter, and Alicia Lucia Morales*
- 6986 **Structure–Property–Activity Relationship of Phenolic Acids and Derivatives. Protocatechuic Acid Alkyl Esters**
Bruno Reis, Maria Martins, Bárbara Barreto, Nuno Milhazes, E. Manuela Garrido, Paulo Silva, Jorge Garrido, and Fernanda Borges**
- 6994 **Kinetics of Myoglobin Redox Form Stabilization by Malate Dehydrogenase**
Anand Mohan, S. Muthukrishnan, Melvin C. Hunt, Thomas J. Barstow, and Terry A. Houser*
- 7001 **Differential Accumulation of Polyphenolics in Black Bean Genotypes Grown in Four Environments**
*M. A. Susan Marles, Parthiba Balasubramanian, and Kirstin E. Best**
- 7007 **Short-Chain Fructooligosaccharide Regulates Hepatic Peroxisome Proliferator-Activated Receptor α and Farnesoid X Receptor Target Gene Expression in Rats**
Tomoyuki Fukusawa, Asuka Kamei, Yuki Watanabe, Jimchiro Koga, and Keiko Abe*
- 7013 **Suppression of γ -Tocotrienol on UVB Induced Inflammation in HaCaT Keratinocytes and HR-1 Hairless Mice via Inflammatory Mediators Multiple Signaling**
Akira Shibata, Kiyotaka Nakagawa, Yuki Kawakami, Tsuyoshi Tsuzuki, and Teruo Miyazawa*
- 7021 **Myoglobin Redox Form Stabilization by Compartmentalized Lactate and Malate Dehydrogenases**
Anand Mohan, Melvin C. Hunt, S. Muthukrishnan, Thomas J. Barstow, and Terry A. Houser*
- 7030 **Dietary Sphingolipids Ameliorate Disorders of Lipid Metabolism in Zucker Fatty Rats**
*Keita Yunoki, Musha Renaguli, Mikio Kinoshita, Hiroyuki Matsuyama, Shiro Mawatari, Takehiko Fujino, Yoshirou Kodama, Masaaki Sugiyama, and Masao Ohmishi**
- 7036 **Seasonal Variations in Skin Pigmentation and Flesh Quality of Atlantic Salmon (*Salmo salar* L.): Implications for Quality Management**
*Eric Leclercq, James R. Dick, John F. Taylor, J. Gordon Bell, Dougie Hunter, and Herve Migaud**
- 7046 **Fractionation of Hairless Canary Seed (*Phalaris canariensis*) into Starch, Protein, and Oil**
El-Sayed M. Abdel-Aul, Pierre Hucl, Carol Ann Patterson, and Danielle Gray*
- 7051 **Stabilization of Whey Protein Isolate–Pectin Complexes by Heat**
*Marie-Claude Gentès, Daniel St-Gelais, and Sylvie L. Turgeon**
- 7059 **Stabilization of Phase Inversion Temperature Nanocemulsions by Surfactant Displacement**
*Jiujia Rao and David Julian McClements**
- 7067 **Stilbenic Profile of Cocoa Liquors from Different Origins Determined by RP-HPLC-APCI(+)-MS/MS. Detection of a New Resveratrol Hexoside**
*Vesna Jerkovic, Meike Bröhan, Elise Monnart, Fanny Nguyen, Sabrina Nizet, and Sonia Collin**
- 7075 **Improvement in High-Fat Diet-Induced Obesity and Body Fat Accumulation by a *Nelumbo nucifera* Leaf Flavonoid-Rich Extract in Mice**
*Cheng-Hsueh Wu, Mon-Yuan Yang, Kwei-Chuan Chan, Pei-Jim Chung, Ting-Tz Ou, and Chau-Jong Wang**
-
- MOLECULAR NUTRITION
- 7082 **Chrysin Suppresses IL-6-Induced Angiogenesis via Down-regulation of JAK1/STAT3 and VEGF: An in Vitro and in Ovo Approach**
Chiu-Mei Lin, Kou-Gi Shyu, Bao-Wei Wang, Hang Chung, Yen-Hsu Chen, and Jen-Hwey Chiü**
- 7088 **Pine Bark Extract Enzogenol Attenuated Tumor Necrosis Factor- α -Induced Endothelial Cell Adhesion and Monocyte Transmigration**
*Dong Shoo Kim, Min-Soo Kim, Sang-Wook Kang, Hye-Young Sung, and Young-Hee Kang**

- 7096 **Allyl Sulfides Inhibit Cell Growth of Skin Cancer Cells through Induction of DNA Damage Mediated G₂/M Arrest and Apoptosis**
Hsiao-Chi Wang, Jen-Hung Yang, Shu-Chen Hsieh, and Lee-Yan Sheen*

- 7104 ***s*-Ethyl Cysteine and *s*-Propyl Cysteine Alleviate β -Amyloid Induced Cytotoxicity in Nerve Growth Factor Differentiated PC12 Cells**
Shih-Jei Tsai, Chia-Yu Lin, Mei-Chin Mong, Mao-Wang Ho, and Mei-Chin Yin*

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Nutritional, Biochemical, and Pharmaceutical Potential of Proteins and Peptides from *Jatropha*: Review

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Increased bioenergy consciousness and high demand for animal products have propelled the search for alternative resources that could meet the dual demands. *Jatropha* seeds have potential to fit these roles in view of their multipurpose uses, broad climatic adaptability features, and high oil and protein contents. During the past five years many large-scale cultivation projects have been undertaken to produce *jatropha* seed oil as a feedstock for the biodiesel industry. The present review aims at providing biological significance of *jatropha* proteins and peptides along with their nutritional and therapeutic applications. The nutritional qualities of the kernel meal and protein concentrates or isolates prepared from seed cake are presented, enabling their efficient use in animal nutrition. In addition, (a) biologically active proteins involved in plant protection, for example, aquaporin and betaine aldehyde dehydrogenase, which have roles in drought resistance, and β -glucanase, which has antifungal activity, as well as those having pharmaceutical properties, and (b) cyclic peptides with various biological activities such as antiproliferative, immunomodulatory, antifungal, and antimalarial activity are discussed. It is expected that the information collated will open avenues for new applications of proteins present in *jatropha* plant, thereby contributing to enhance the financial viability and sustainability of a *jatropha*-based biodiesel industry.

KEYWORDS: *Jatropha curcas*; proteins; cyclic peptides; animal nutrition

INTRODUCTION

The oilseed proteins have a descriptive history in both nutrition and therapeutic applications. In plants, proteins are broadly classified as (a) storage proteins, which are devoid of functional activity but are used during germination, and (b) functional proteins such as enzymes, hormones, defense proteins, and structural proteins that have definite roles in the plant system (1).

From a nutritional perspective, seed storage proteins have always been major players in supplying global protein needs and food energy intake. In recent years, increased global industrialization and increased demand for livestock products for meeting human food demand have greatly increased the pressure on agricultural land and the environment (2, 3). Higher need for proteins in the livestock sector has accentuated the search for new protein sources that do not conflict with human food security interests. In the current situation, nonedible oil seeds are the potential and preferred choice for protein and other nutrients for livestock, provided these could be made free of toxic and anti-nutritional factors. One promising oilseed plant is *Jatropha curcas* (Euphorbiaceae), which has advantages over other oilseed plants (e.g., *Pongamia pinnata*, *Samarouba glauca*, *Ricinus communis*, *Azadirachta indica*) because of its wide adaptability to grow under various agroclimatic conditions, for example, adverse soil conditions, drought areas, marginal lands, arid as well as higher

rainfall conditions, and land with thin soil cover (4). More importantly, *jatropha* seed oil has gained tremendous interest as a feedstock for biodiesel industries.

Large-scale *jatropha* cultivation projects have been initiated in the past 5–10 years with a projected worldwide cultivation of 12.8 million hectares yielding 2 t/ha of oil by 2015 (Global Exchange for Social Investment market study (GEXSI) (5)). In the future this will result in the availability of high amounts of pressed seed cake or kernel meal as byproducts, which are rich in proteins of high quality. These byproducts can be utilized in animal nutrition after detoxification and could also be a source for various bioactive protein molecules having a wide range of activities. Approximately 60% of the antitumor and anti-infectious drugs that are already in the market or under clinical trials are of natural origin. A vast majority of these compounds cannot yet be synthesized economically, and their use relies on wild or cultivated plants (6). In pharmaceutical, industrial, or agricultural perspectives, similar to other oilseed plants, *jatropha* species are also rich sources of phytochemicals. *Jatropha* proteins and peptides have been studied for their roles in the plant's own metabolic activities and defense against predators as well as a therapeutic and industrial potential.

In the present review an attempt has been made to discuss (a) the nutritional quality of *jatropha* proteins and their potential for animal nutrition, and (b) the chemistry, biological role, and potential applications of biologically active *jatropha* proteins and peptides. The *jatropha* plant also contains an interesting

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