Oil Extraction and Analysis
Critical Issues and Comparative Studies

Editor

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During the past two decades, there has been remarkable advancement in the field of biotechnology. The first phase of genetic engineering in crops was centered on agronomic traits, whereas the current trend focuses on value-added traits such as oil or protein content, modifications, or yield enhancement. This biotechnology advancement in conjunction with the globalization in trade has resulted in the development of new opportunities and challenges for the industry and society.

Appropriate valuation and differentiation of these value-added quality products around the globe pose a major challenge faced by large number of industries and other grading organizations in different regions of the world. This is caused by differences in the technologies and procedures approved by various official agencies for the assay of value-added traits.

Accurate determination and proper assessment of value-enhanced products are critical for the success of the biotechnology industry in the global market place. There is a crucial need for harmonization of assay procedures among different official agencies around the globe. This book attempts to address these issues by using crude fat as an example of how this approach could be extended to other value-added products.

The topic of accurate determination of oil content in oil seeds is of significant interest to the members of the AOCS and is strongly supported at the organization level. A symposium entitled “Critical Issues, Current and Emerging Technologies for Determination of Crude Fat Content in Food, Feed and Seeds” was held at the AOCS Annual Meeting in Kansas City, MO in May 2003. This book contains represented papers from this symposium.

The book is divided into five sections: Section 1 deals with the economic significance of accurate determination of crude fat and the need for harmonization of procedures among different official agencies around the world. Section 2 describes in detail the different extraction technologies and their principles that have been used for crude fat content determination. These technologies can also be extended to other products. Section 3 provides a comparison of different primary extraction technologies and identifies the importance of sample preparation and issues related to crude fat analysis. Sections 4 and 5 depict current and emerging secondary rapid nondestructive technologies (e.g., NIR and NMR) used for crude fat determination.

The topics covered give a broad perspective of the challenges and issues of the value-added enhanced products. Addressing assay of quality and product differentiation is vital if the maximal potential of biotechnology is to be fully realized. In bringing out this book, the editor realizes that the contributors to the chapters have not written the last word; indeed, some of this work is in its infancy. It is sincerely hoped that this book will be of interest to biotechnology professionals, processors, scientists, nutritionists, economists, new product development and business profes-
sionals, official agencies, and others actively engaged in development and market-
ing of value-added products.

Contributions by all of the authors are gratefully appreciated. The author is also thankful to family, friends, and colleagues at Monsanto and USDA-ARS for their encouragement and support.

D.L. Luthria
Preface

Section I Introduction

Technology is one aspect of today that is truly fresh and burning with new tunes and story turns. So there is and can be content in technology—new tunes we’ve never heard before because they’ve never been possible before. (Francis Ford Coppola)

Chapter 1 The Commercial Significance of Oil Content Analysis: The Position of Official Methods
Richard C. Cantrill

Section II Primary Reference Methods for Crude Fat Determination

Science and technology multiply around us. To an increasing extent they dictate the languages in which we speak and think. Either we use those languages, or we remain mute. (J.G. Ballard)

Chapter 2 Soxtec: Its Principles and Applications
Shirley Anderson

Chapter 3 Accelerated Solvent Extraction
Devanand Luthria, Dutt Vinjamoori, Kirk Noel, and John Ezzell

Chapter 4 Evaluation of the Rapid, High-Temperature Extraction of Feeds, Foods, and Oilseeds by the ANKOM\textsuperscript{XT20} Fat Analyzer to Determine Crude Fat Content
L.R. Rudnick

Chapter 5 Analytical Supercritical Fluid Extraction for Food Applications
Tracy Doane-Weideman and Phillip B. Liescheskii

Section III Comparative Evaluation of Primary Reference Methods and Issues Related to Oil Analysis

The higher we soar on the wings of science, the worse our feet seem to get entangled in the wires. (Anonymous)
Chapter 6  Oil Content Analysis: Myths and Reality  
V.J. Barthet and J.K. Daun

Chapter 7  Effect of Moisture Content, Grinding, and Extraction  
Technologies on Assays of Crude Fat  
Devanand L. Luthria, Kirk Noel, and Dutt Vinjamoori

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Section IV  Secondary Methods for Crude Fat Analysis  
Science may be described as the art of systematic oversimplification.  
(Karl Popper)

Chapter 8  The Rapid Determination of Fat and Moisture in Foods  
by Microwave Drying and NMR Analysis  
Bobbie McManus and Michelle Horn

Chapter 9  Simple Methods for Total Oil Content by Benchtop NMR  
P.H. Krygsman, A.E. Barrett, W. Burk, and H.W. Todt

Chapter 10  Internet-Enabled Near-Infrared Analysis of Oilseeds  
Ching-Hui Tseng, Kangming Ma, and Nan Wang

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Section V  Emerging Technologies  
Invention breeds inventions. (Anonymous)

Chapter 11  High-Resolution Nuclear Magnetic Resonance and  
Near Infrared Determination of Soybean Oil, Protein,  
and Amino Acid Residues in Soybean Seeds  
I.C. Baianu, T. You, D.M. Costescu, P.R. Lozano, V. Prisecaru,  
and R.L. Nelson

Chapter 12  Near Infrared Microspectroscopy, Fluorescence  
Microspectroscopy, Infrared Chemical Imaging and  
High-Resolution Nuclear Magnetic Resonance Analysis  
of Soybean Seeds, Somatic Embryos and Single Cells  
I.C. Baianu, D. Costescu, T. You, P.R. Lozano, N.E. Hofmann,  
and S.S. Korban

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