



Technical variability of 2D gel electrophoresis – Application to soybean allergens



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ABSTRACT

Two-dimensional gel electrophoresis (2-DE) technique is used as a performing technique to assess the variability of protein expression in crops, and especially soybean endogenous food allergens, which are a subset of proteins of interest for assessing whether genetically modified (GM) soybean has a different allergenic profile compared to its non-GM counterpart.

On top of the biological variability of the 2-DE, which has already been studied by several laboratories, technical variability has to be evaluated. In this study, several sources of variability (number of gel replicates, protein extracts, study timings and operators) were assessed qualitatively and quantitatively on all detectable polypeptide spots as well as on food allergen spots. Results showed that the major source of variability was the number of gel replicates. Other sources were minor.

This has a direct practical impact on the laboratory work as this supports the utilization of three or four gel replicates to get robust results. Furthermore, this implies that the study can be run over several days, and be performed by several trained operators, without impacting its reproducibility.

Furthermore, 2-DE could detect a 2-fold change between two samples with an acceptable rate of false positives (below 7%). This level of sensitivity is acceptable in the context of safety assessment of GM soybean as the biological variability of proteins in soybean is higher than the technical variability shown in this study.

Overall, the 2-DE technique is suitable for investigating endogenous food allergen variability between several soybean seeds, including GM and non-GM counterpart.

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1. Introduction

2-DE is a technique for studying protein expression in biological systems such as crops. Several thousands of proteins can be visualized and quantified simultaneously, which allows comparisons under various experimental conditions [17]. For example, influence on protein expression of crop variety (genetic background), growing conditions (e.g. latitude, weather conditions, diseases, soil, exposure to sun) and/or maturity stage can be assessed [1,18,40,42]. Among these proteins, endogenous allergens are a subset of proteins of interest for assessing the

Abbreviations: 2-DE, two-dimensional gel electrophoresis; CV, coefficient of variation expressed as percentage; GM, genetically modified; IEF, isoelectric focusing; IPC, immobilized pH gradient; SDS-PAGE, sodium dodecyl sulfate polyacrylamide gel electrophoresis.

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Electrophoresis Technical Application

B. J. Haywood



Electrophoresis Technical Application:

NASA Technical Memorandum ,1988 **National Library of Medicine Current Catalog** National Library of Medicine (U.S.),1969 First multi year cumulation covers six years 1965 70 **Epigenetic Technological Applications** Yujun George Zheng,2015-05-30 Epigenetic Technological Applications is a compilation of state of the art technologies involved in epigenetic research Epigenetics is an exciting new field of biology research and many technologies are invented and developed specifically for epigenetics study With chapters covering the latest developments in crystallography computational modeling the uses of histones and more Epigenetic Technological Applications addresses the question of how these new ideas procedures and innovations can be applied to current epigenetics research and how they can keep pushing discovery forward and beyond the epigenetic realm Discusses technologies that are critical for epigenetic research and application Includes epigenetic applications for state of the art technologies Contains a global perspective on the future of epigenetics

Principles of Enzymology for Technological Applications Trevor Palmer,1993 A knowledge of enzymes is essential in many scientific and industrial applications This book aims to provide a firm understanding of the structure properties isolation and analysis of these important molecules The emphasis is on the underpinning principles although the text reveals some of the practical issues and uses of enzymes Step by step logical development Student centered learning style The need for a cost effective training scheme for new and existing staff at all levels has been met by the University of Greenwich formerly Thames Polytechnic and the Open University of the Netherlands As part of the European Community Education and Technology Training initiative COMETT and in conjunction with a number of other leading UK and European universities they are developing BIOTOL a training scheme in biotechnology using open learning materials which will provide tailor made courses flexible in content pace and place **Technological Approaches for Novel Applications in Dairy Processing**

Nurcan Koca,2018-06-20 Technological innovations customer expectations and economical situations have been forcing the dairy industry to adapt to changes in technologies and products The goal of this book is to present some new approaches on dairy processing It will provide several applications on the use of some novel technologies in various dairy products the improvement of functionalities and quality systems of dairy products and the advances in dairy wastewater treatment The book will be useful for both practicing professionals and researchers in the dairy field I would like to send my sincere thanks to all the authors for their hard work and contributions **Capillary Electrophoresis Technology** Norberto A.

Guzman,1993-08-10 Tracing the sequence of observations that has led to current understanding in the field this reference presents the basic concepts instrumentation and applications of capillary electrophoresis examining its many features such as high power resolution high mass sensitivity overall sensitivity and low sample volume requirements This work highlights the use of capillary elctrophoresis for the identification separation detection and characterization of substances on the molecular counting level Illustrating the major technical maneuvers for common operations and applications Capillary

Electrophoresis Technology outlines the theoretical concepts and mathematical expressions of capillary electrophoresis describes advances in instrumentation hardware and detection systems It explains the advantages and limitations of the different variants of capillary electrophoresis and provides extra coverage of areas in which capillary electrophoresis has grown increasingly popular including the identification and characterization of small molecules and macromolecules Written by experts in the field this book is aimed at analytical and clinical chemists and biochemists chemical engineers biologists pharmacists biotechnologists and students in these disciplines Bioanalytics Friedrich Lottspeich, Joachim W.

Engels, 2018-03-08 Analytical methods are the essential enabling tools of the modern biosciences This book presents a comprehensive introduction into these analytical methods including their physical and chemical backgrounds as well as a discussion of the strengths and weakness of each method It covers all major techniques for the determination and experimental analysis of biological macromolecules including proteins carbohydrates lipids and nucleic acids The presentation includes frequent cross references in order to highlight the many connections between different techniques The book provides a bird s eye view of the entire subject and enables the reader to select the most appropriate method for any given bioanalytical challenge This makes the book a handy resource for students and researchers in setting up and evaluating experimental research The depth of the analysis and the comprehensive nature of the coverage mean that there is also a great deal of new material even for experienced experimentalists The following techniques are covered in detail Purification and determination of proteins Measuring enzymatic activity Microcalorimetry Immunoassays affinity chromatography and other immunological methods Cross linking cleavage and chemical modification of proteins Light microscopy electron microscopy and atomic force microscopy Chromatographic and electrophoretic techniques Protein sequence and composition analysis Mass spectrometry methods Measuring protein protein interactions Biosensors NMR and EPR of biomolecules Electron microscopy and X ray structure analysis Carbohydrate and lipid analysis Analysis of posttranslational modifications Isolation and determination of nucleic acids DNA hybridization techniques Polymerase chain reaction techniques Protein sequence and composition analysis DNA sequence and epigenetic modification analysis Analysis of protein nucleic acid interactions Analysis of sequence data Proteomics metabolomics peptidomics and toponomics Chemical biology **Scientific and Technical Aerospace Reports** ,1988 **Carbon-Based Nanomaterials for**

Sustainable and Technological Applications Loutfy H. Madkour, 2024-10-29 Carbon Based Nanomaterials for Sustainable and Technological Applications covers the fundamentals of carbon based nanomaterials CNMs and their potential for technological and industrial applications Addressing recent advancements in technology and improvement in material synthesis the book outlines how functionalized CNMs are used in nanobiotechnology for active sorbent materials and in pharmaceutical applications Chapters cover macro scale applications biosensors and drug delivery and treatment in cancer and coronavirus diseases Key features Through up to date references this book demonstrates that carbon based

nanomaterials are one of the most promising nanomaterials in medical applications such as drug and gene delivery carriers as well as nonmedical environmental applications Discusses the synthesis methods of processing CQDs GQDs CPDs and g C3N4 materials based nanocomposites for biotechnological applications Chapters address various classes of carbon nanomaterials and their innovative technologies Opens up further exploration of environmental nanotechnology bionanotechnology and biomedical applications of novel carbon nanomaterials Full references can be found via the Support Material www.routledge.com/9781032635934 Written by a leading expert this volume provides the reader with thorough coverage of bionanotechnology and biomedical applications of novel carbon nanomaterials Biofilm Applications to Revolutionize Food Technology Tanmay Sarkar, Dibyajit Lahiri, Moupriya Nag, Debasmita Bhattacharya, 2025-05-12 Biofilm Applications to Transform the Food Industry is a sweeping introduction to the world of biofilms illuminating their potential to revolutionize the landscape of both food safety and culinary innovation This groundbreaking work delves into the various methods through which biofilms improve quality and sensory aspects while also enhancing overall safety and sustainability At its core this book addresses the preeminent challenge facing the food industry how to optimize taste enhance safety and extend shelf life without compromising nutritional value It offers a dynamic blueprint for chefs food scientists and industry professionals to leverage biofilm usage exploring cutting edge techniques that revolutionize fermentation flavor enhancement and waste reduction By decoding the intricate mechanisms of biofilm interactions this work unveils solutions to persistent industry challenges providing practical insights and strategies to elevate culinary experiences while meeting consumer demands for healthier safer and more flavorful foods Biofilm Applications to Transform the Food Industry is an indispensable guide for culinary professionals food technologists and enthusiasts seeking to stay ahead in a rapidly evolving industry It equips readers with the tools to navigate the complexities of biofilm applications empowering them to innovate create ethically sound products and contribute to a more sustainable future This title's relevance lies in its ability to bridge the gap between cutting edge science and practical culinary applications making it an essential resource for those passionate about shaping the future of food technology *Oxygen Ion and Mixed Conductors and Their Technological Applications* H.L. Tuller, Johannes Schoonman, Ilan Riess, 2000-10-31 Progress in the development of oxygen ion and mixed conductors is responsible for innovations in gas sensors fuel cells oxygen permeation membranes oxygen pumps and electrolyzers Commercialization has been impeded by material stability and compatibility issues high fabrication costs and an inadequate understanding of the interfacial phenomena controlling the operation of the devices Here a group of experts cover all the key topical areas ranging from fundamentals relating to a defects electrochemical and interfacial processes b catalysis electrocatalysis and gas reforming to design and fabrication including c advanced electroceramic processing methods d materials selection and optimization e and applications including scale up commercialization and competitive technologies Readership Materials scientists chemists physicists and chemical and electrical engineers either first entering the field or

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