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Secondary-Metabolite Biosynthesis and Metabolism The Biosynthesis of Secondary Metabolites Biosynthesis and Molecular Genetics of Fungal Secondary Metabolites The Biosynthesis of Secondary Metabolites Biosynthesis and Molecular Genetics of Fungal Secondary Metabolites, Volume 2 Plant Metabolism and Biotechnology Antibiotics and Other Secondary Metabolites: Biosynthesis and Production Antibiotics and Other Secondary Metabolites Molecular Mechanism for the Biosynthesis and Regulation of Secondary Metabolites in Lysobacter Carotenoids, Volume 3: Biosynthesis and Metabolism Biosynthesis and Translocation of Secondary Metabolite Glycosides in the Grapevine Vitis Vinifera L. Flavonoids: From Biosynthesis and Metabolism to Health Benefits Biosynthesis and Function of Secondary Metabolites Bioactive Compounds Biosynthesis and Metabolism in Fruit and Vegetables Modern Biocatalysis Biosynthesis and Heterologous Production of Myxobacterial Secondary Metabolites Secondary Metabolites Synthetic Biology and Metabolic Engineering in Plants and Microbes Part A: Metabolism in Microbes Biosynthesis and the Integration of Cell Metabolism Biosynthesis and Metabolism of Indolic Fungal Metabolites BIOSYNTHESIS AND MOLECULAR GENETICS OF FUNGAL SECONDARY METABOLITES Molecular Genetics and Enzymology of Secondary Metabolite Biosynthesis Molecular Genetic Analysis of Secondary Metabolite Biosynthesis in Cassava as an Economic and Nutritious Plant Metabolic Pathways Characterizing the Role of CFL, OSR and SDR in the Biosynthesis of the Streptomyces Scabies COR-like Metabolites Starch Studies on the Biosynthesis and Heterologous Expression of Complex Secondary Metabolites from Streptomycetes Annual Plant Reviews, Biochemistry of Plant Secondary Metabolism Development of Bioinformatic Methods for the Prediction and Understanding of Biosynthesis and Activity of Natural Products Exploring the Biosynthesis and Regulation of Novel Secondary Metabolite Gene Clusters in Fusarium Fujikurio Via a Combination of Bioinformatic, Molecular and Chemical Approaches Studies on the Biosynthesis and Structure of Radicinin: a Mold Metabolite Evolution and Structure - Function Analysis of Core Enzymes in Galloylated Metabolite Biosynthesis and Flavonoid Glycosylation Synthetic Biology and Metabolic Engineering in Plants and Microbes Part B: Metabolism in Plants Solanaceae and Convolvulaceae: Secondary Metabolites Microbial Secondary Metabolites Chemistry, Biosynthesis and Bioactivity of Secondary Metabolites from Nannocystis and Myxococcus Species Biosynthesis and Metabolism Biocontrol Agents and Secondary Metabolites Plant Nucleotide Metabolism Synthesis and Biosynthesis of Some Mould Metabolites

BIOSYNTHESIS AND MOLECULAR GENETICS OF FUNGAL SECONDARY METABOLITES Jun 06 2021
Synthesis and Biosynthesis of Some Mould Metabolites Oct 18 2019
Bioactive Compounds Biosynthesis and Metabolism in Fruit and Vegetables Jan 13 2022
Biosynthesis and Translocation of Secondary Metabolite Glycosides in the Grapevine Vitis Vinifera L. Apr 16 2022 This study investigates the site of biosynthesis of flavour compounds in the grapevine. Most of the secondary metabolites, including flavour compounds, are glycosylated and stored in plant tissues as glycosides. The chemical properties of these compounds, especially their water solubility, suggests that glycosides might be forms of translocated secondary metabolites in plants.
Evolution and Structure - Function Analysis of Core Enzymes in Galloylated Metabolite Biosynthesis and Flavonoid Glycosylation Jun 25 2020 UDP-dependent glycosyltransferases (UGTs) convert aglycones into more stable, bioactive, and structurally diverse glycosylated derivatives. Group L UGTs responsible for forming [beta]-acetal esters, which enables serine carboxypeptidase like acyltransferases (SCPL-ATs) to bring together, through acylation, compounds from the same or divergent metabolic pathways. These glycosylations and acylations, together with other modifications, play a significant role in producing the incredible diversity of plant specialized metabolites that play important roles in plant-environment interactions as well as the promotion of human and animal health. Pomegranate (Punica granatum L.) produces various glycosylated and acylated phenolic metabolites and constitutes an excellent system for investigating the corresponding UGT and SCPL activities. Specifically, galloylation reactions are mediated by the formation of [beta]-glucogallin from gallic acid and UDP-glucose, catalyzed by the plant UGT84 family glycosyltransferases. The sub-cellular localization of PgUGT84A23 and PgUGT84A24, the [beta]-glucogallin forming UGTs from pomegranate, was determined by immunogold labeling as well as subcellular fractionation with detection by western blot and mass spectrometry. Cytosolic localization (with potential association with the endomembrane system) was indicated by these analyses, raising questions about the localization of the other enzymes in the pathway and the presence of transporters. To explore and exploit the structural determinants of UGT84 activities, homology modeling and substrate docking of PgUGT84A23 as well as sequence comparisons of PgUGT84A23 with other functionally characterized plant UGTs were performed. By employing site-directed mutagenesis of candidate amino acids, enzyme assays with analogous substrates, and kinetic analysis, key amino acid sites for PgUGT84A23 substrate binding and reactivity were elucidated. To better understand the accumulation of ether linked galloyl glucosides in PgUGT84A23 and PgUGT84A24 RNAi double knockdown pomegranate hairy root lines, cloning and functional characterization of PgUGT95B2 was conducted. It was determined through enzyme assays that PgUGT95B2 is highly active towards flavones and flavonols (with the strongest activity towards tricetin) and can glycosylate at more than one position in the substrate molecule. In addition, PgUGT95B2 was able to glycosylate flavones present in pomegranate metabolite extracts. Phylogenetic analysis suggested an independent evolution of PgUGT95B2 and flavone/flavonol UGTs identified in the model plant Arabidopsis thaliana through convergent evolution or gene loss. To better understand the evolutionary history of all the phylogenetic groups of UGTs a phylogenomic analysis was conducted. This analysis showed that A. thaliana is not representative of the average distribution of UGTs in the seed plants and that shifts in the distribution of the UGTs between the groups suggests shifts in metabolism and convergence and selective loss. To confirm previous reports on the nature of the digalloylglucose forming enzyme from other species, partial purification of this activity from pomegranate stems and roots was achieved. Several SCPL-AT candidates

for the formation of di- to penta- galloylglucose were cloned, expressed as His-tagged proteins heterologously in Nicotiana benthamiana, purified and tested for activity with [beta]-glucogallin. Ellagic acid was detected as a product of the reaction, however the presence or identity of any co-purified enzymes was not determined. Overall, this work provides a better understanding of the structure-function relationship of UGTs as well as their evolutionary history and localization (at the tissue and sub-cellular levels). This understanding will facilitate further studies into the basic plant physiology responsible for environmental interactions and enzyme engineering to produce pharmaceutically and industrially valuable compounds.

Synthetic Biology and Metabolic Engineering in Plants and Microbes Part A: Metabolism in Microbes Sep 09 2021 Synthetic Biology and Metabolic Engineering in Plants and Microbes: Part A, the new volume in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. This volume covers research methods, synthetic biology, and metabolic engineering in plants and microbes, and includes sections on such topics as the uses of integrases in microbial engineering, biosynthesis, and engineering of tryptophan derived metabolites, regulation and discovery of fungal natural products, and elucidation and localization of plant pathways. Continues the legacy of this premier serial with quality chapters authored by leaders in the field Contains two volumes covering research methods in synthetic biology and metabolic engineering in plants and microbes Presents sections on such topics as the uses of integrases in microbial engineering, biosynthesis, and engineering of tryptophan derived metabolites, regulation and discovery of fungal natural products, and elucidation and localization of plant pathways

Characterizing the Role of CFL, OSR and SDR in the Biosynthesis of the Streptomyces Scabies COR-like Metabolites Feb 02 2021 Streptomyces is the largest genus of actinobacteria and consists of Gram-positive filamentous organisms that mainly inhabit soil environments. Some members of this genus have the ability to cause economically important crop diseases such as potato common scab (CS), which is characterized by the formation of superficial, raised or pitted corky-like lesions on the surface of potato tubers. Among the virulence factors produced by the best characterized CS-causing pathogen, S. scabies are the phytotoxic secondary metabolites called the COR-like metabolites, which resemble the coronatine (COR) phytotoxin produced by the plant pathogenic bacterium Pseudomonas syringae. The objective of this study was to characterize the role of three S. scabies genes (cfl, oxr and sdr) in the biosynthesis of the COR-like metabolites by constructing gene deletion mutants and examining the effect of each mutation on metabolite biosynthesis and bioactivity. The results of this study indicate that all three genes are necessary for normal production of the COR-like metabolites in S. scabies, and possible roles for each gene in the biosynthetic pathway are discussed.

Chemistry, Biosynthesis and Bioactivity of Secondary Metabolites from Nannocystis and Myxococcus Species Feb 20 2020

Exploring the Biosynthesis and Regulation of Novel Secondary Metabolite Gene Clusters in Fusarium Fujikurio Via a Combination of Bioinformatic, Molecular and Chemical Approaches Aug 28 2020

Biosynthesis and Heterologous Production of Myxobacterial Secondary Metabolites Nov 11 2021

Biosynthesis and Function of Secondary Metabolites Feb 14 2022

Molecular Genetics and Enzymology of Secondary Metabolite Biosynthesis May 05 2021

Solanaceae and Convolvulaceae: Secondary Metabolites Apr 23 2020 This comprehensive and interdisciplinary handbook provides a

bird's-eye view of two centuries of research on secondary metabolites of the two large Solanales families, Solanaceae and Convolvulaceae. In this book they're arranged according to their biosynthetic principles, while the occurrence and chemical structures of almost all known individual secondary metabolites are covered, which are found in hundreds of wild as well as cultivated solanaceous and convolvulaceous species.

Antibiotics and Other Secondary Metabolites Jul 19 2022

Biosynthesis and Metabolism Jan 21 2020

Biosynthesis and Metabolism of Indolic Fungal Metabolites Jul 07 2021

Molecular Mechanism for the Biosynthesis and Regulation of Secondary Metabolites in Lysobacter Jun 18 2022 This thesis presents regulatory and biosynthetic mechanisms by which microorganisms produce secondary metabolites that can potentially be developed into drugs beneficial to humans. The first section shows the role of small signaling molecules in regulating the production of one of the novel antifungal metabolites, heat stable antifungal factor (HSAF), from Lysobacter enzymogenes. In the second part of the thesis I report our attempts to isolate and characterize the biosynthesis of WBP, a new secondary metabolite from Lysobacter antibioticus OH13. I have included the in-silico analysis of the gene cluster for WBP and the predicted biosynthetic pathway based on analysis of the genes. I have also included the work to delete part of the gene responsible for the biosynthesis of WBP, which is still in progress.

Studies on the Biosynthesis and Heterologous Expression of Complex Secondary Metabolites from Streptomycetes Nov 30 2020

Biosynthesis and the Integration of Cell Metabolism Aug 08 2021 This book discusses the following: uptake of nutrients, nitrogen and sulphur assimilation, amino acid and nucleotide biosynthesis, the biosynthesis of carbohydrates, the integration and regulation of metabolism and control of metabolic pathway flux.

Metabolic Pathways Mar 03 2021 Metabolic Pathways, Volume II focuses on the metabolism, biosynthesis, and catabolism of amino acids. The selection first offers information on nitrogen and carbon metabolism of amino acids. Discussions focus on amino acids linked with citric acid cycle, sulfur amino acids, proline and hydroxyproline, histidine, hydroxyamino acids, urea biosynthesis and related systems, and deamidation. The text then ponders on the biosynthesis of amino acids and related compounds and metabolism of sulfur-containing compounds. Topics include metabolism of methionine, biotin, biological importance of sulfur in animals, interconversions of glutamic acid, ornithine, and prolines, and biosynthesis of the branched-chain amino acids. The publication takes a look at the synthesis of proteins, purines and pyrimidines, and nucleotides and nucleosides, including the components of nucleotides, purine degradation, and incorporation of preformed purine compounds into nucleic acids. The selection is a valuable reference for researchers interested in the metabolism, catabolism, and biosynthesis of amino acids.

Plant Metabolism and Biotechnology Sep 21 2022 Various plant metabolites are useful for human life, and the induction and reduction of these metabolites using modern biotechnical technique is of enormous potential important especially in the fields of agriculture and health. Plant Metabolism and Biotechnology describes the biosynthetic pathways of plant metabolites, their function in plants, and some applications for biotechnology. Topics covered include: biosynthesis and metabolism of starch and sugars lipid biosynthesis symbiotic nitrogen fixation sulfur metabolism nucleotide metabolism purine alkaloid metabolism nicotine biosynthesis terpenoid biosynthesis benzylisoquinoline alkaloid

biosynthesis monoterpenoid indole alkaloid biosynthesis flavonoid biosynthesis pigment biosynthesis: anthocyanins, betacyanins and carotenoids metabolomics in biotechnology Plant Metabolism and Biotechnology is an essential guide to this important field for researchers and students of biochemistry, plant biology, metabolic engineering, biotechnology, food science, agriculture, and medicine.

Studies on the Biosynthesis and Structure of Radicinin: a Mold Metabolite Jul 27 2020

Microbial Secondary Metabolites Mar 23 2020

Annual Plant Reviews, Biochemistry of Plant Secondary Metabolism Oct 30 2020 This brand new Annual Plant Reviews volume is the second edition of the highly successful and well-received Annual Plant Reviews, Volume 2. This exciting new volume provides an up-to-date survey of the biochemistry and physiology of plant secondary metabolism. The volume commences with an overview of the biochemistry, physiology and function of secondary metabolism, followed by detailed reviews of the major groups of secondary metabolites: alkaloids and betalains, cyanogenic glucosides, glucosinolates and nonprotein amino acids, phenyl propanoids and related phenolics, terpenoids, cardiac glycosides and saponins. A final chapter discusses the evolution of secondary metabolism. This carefully compiled new edition brings together chapters from some of the world's leading experts in plant secondary metabolism. Completely revised and brought right up to date with much new information, this volume is an essential purchase for advanced students, researchers and professionals in biochemistry, physiology, molecular biology, genetics, plant sciences, agriculture, medicine, pharmacology and pharmacy, working in the academic and industrial sectors, including those working in the pesticide and pharmaceutical industries. Libraries in all universities and research establishments where these subjects are studied and taught will need copies of this excellent volume on their shelves. A companion volume Annual Plant Reviews Volume 39, Functions and Biotechnology of Plant Secondary Metabolites, Second Edition, Edited by M. Wink, is also available.

Plant Nucleotide Metabolism Nov 18 2019 All organisms produce nucleobases, nucleosides, and nucleotides of purines and pyrimidines. However, while there have been a number of texts on nucleotide metabolism in microorganisms and humans, the presence of these phenomena in plant life has gone comparatively unexplored. This ground-breaking new book is the first to focus exclusively on the aspects of purine nucleotide metabolism and function that are particular to plants, making it a unique and essential resource. The authors provide a comprehensive break down of purine nucleotide structures and metabolic pathways, covering all facets of the topic. Furthermore, they explain the role that purine nucleotides can play in plant development, as well as the effects they may have on human health when ingested. Plant Nucleotide Metabolism offers a unique and important resource to all students, researchers, and lecturers working in plant biochemistry, physiology, chemistry, agricultural sciences, nutrition, and associated fields of research.

Synthetic Biology and Metabolic Engineering in Plants and Microbes Part B: Metabolism in Plants May 25 2020 Synthetic Biology and Metabolic Engineering in Plants and Microbes, Part B, the latest volume in the Methods in Enzymology series, continues the legacy of this premier serial with quality chapters authored by leaders in the field. This volume covers research methods, synthetic biology, and metabolic engineering in plants and microbes, and includes sections on such topics as the usage of integrases in microbial engineering, biosynthesis, and engineering of tryptophan derived metabolites, regulation and discovery of fungal natural products, and elucidation and localization of plant pathways. Continues the legacy of this premier serial with quality chapters authored by leaders in the field of enzymology Contains two volumes covering research methods in synthetic biology and metabolic engineering in plants and microbes Includes sections on such topics as

the uses of integrases in microbial engineering, biosynthesis and engineering of tryptophan derived metabolites, regulation and discovery of fungal natural products, and elucidation and localization of plant pathways

Biosynthesis and Molecular Genetics of Fungal Secondary Metabolites Dec 24 2022 This volume describes the more relevant secondary metabolites of different fungi with current information on their biosynthesis and molecular genetics. Bolstered with color illustrations and photographs, the book describes the possible application of molecular genetics to directed strain improvement in great detail. The needs for future developments in this field are also discussed at length Written by authorities in the field, Biosynthesis and Molecular Genetics of Fungal Secondary Metabolites provides a cutting-edge perspective on fungal secondary metabolism and underlying genetics and is a valuable resource for scientists, researchers, and educators in the field of fungal biology.

Starch Jan 01 2021 This book provides a detailed overview of the current understanding of the metabolic system of starch biosynthesis and degradation in plants. The focus is on new topics regarding the functional interaction between multiple enzymes and the initiation process of starch biosynthesis, which are essential for further understanding of related metabolic features. The book also explains and discusses the distinct structures of amylopectin and amylose and the crystalline structure of starch granules. At the same time, readers will be made aware of areas where further research remains to be done, such as the regulation of starch metabolism, the fine structure of starch molecules, and the manipulation of the structure and functional properties of starch by genetic and molecular technology. Also described are aspects of the biosynthetic machinery of starch, the structure and metabolism of which have developed and been refined during the process of plant evolution. In addition, recent approaches to producing novel starches with distinct physicochemical and functional properties in gene-modified mutants and transgenic plants for industrial applications are introduced. Finally, the book elaborates on the unresolved topics, necessary approaches and future prospects to achieve a complete understanding of the regulation of starch metabolism. This volume is of great value for general scientists, students and anyone wishing to understand the specific and complicated events of starch metabolism and biotechnology. It will be especially useful for food scientists and engineers in academia and industry.

Modern Biocatalysis Dec 12 2021 The synergy between synthetic biology and biocatalysis is emerging as an important trend for future sustainable processes. This book reviews all modern and novel techniques successfully implemented in biocatalysis, in an effort to provide better performing enzymatic systems and novel biosynthetic routes to (non-)natural products. This includes the use of molecular techniques in protein design and engineering, construction of artificial metabolic pathways, and application of computational methods for enzyme discovery and design. Stress is placed on current ‘hot’ topics in biocatalysis, where recent advances in research are defining new grounds in enzyme-catalyzed processes. With contributions from leading academics around the world, this book makes a ground-breaking contribution to this progressive field and is essential reading for graduates and researchers investigating (bio)catalysis, enzyme engineering, chemical biology, and synthetic biology.

Carotenoids, Volume 3: Biosynthesis and Metabolism May 17 2022 Volume 3 of the Carotenoids series moves into the area of biochemistry & biology, concentrating on how the carotenoid molecules are formed in nature & utilized or modified by living organisms. Animals cannot biosynthesize carotenoids de novo. Dietary carotenoids provide most of the vitamin A that is vital for health & development in humans & other mammals. The formation of vitamin A & the absorption, transport & deposition of carotenoids in tissues in mammals are described,

followed by a detailed account of the diverse metabolic reactions by which dietary carotenoids undergo structural & stereochemical changes in birds, fish & invertebrate animals. The relevance of carotenoids for use as markers to trace food chains is also discussed. In keeping with the philosophy of the carotenoid series guidance on the application of some of the most important experimental procedures for studies of biosynthesis & metabolism are given in the final chapter. The information presented & analyzed by expert authors in this volume will serve as a useful reference source, & give valuable guidance on practical strategies & procedures, as a foundation for the exciting advances that can be expected in carotenoid biosynthesis & metabolism in the next few years.

Molecular Genetic Analysis of Secondary Metabolite Biosynthesis in Cassava as an Economic and Nutritious Plant Apr 04 2021 Cassava (Manihot esculenta Crantz Family Euphorbiaceae) is an important tropical food crop. However, harvested cassava roots have a shelf-life of only days due to post-harvest physiological deterioration (PPD). Within 1-3 days of harvesting, the roots show blue-black vascular streaking and are unpalatable. PPD includes altered gene expression and the accumulation of hydroxycoumarin secondary metabolites, e.g. scopoletin and esculetin, and their respective glucosides scopolin and esculin. In this research several important aspects of the biosynthesis of these phytochemically important hydroxycoumarins were resolved. Stable isotopically labelled intermediates on the postulated biosynthetic pathways of scopoletin were fed to cassava cubes and PPD was allowed to occur. Ethanolic extracts of these deteriorated roots were separated (HPLC) and analysed (HRESI-MS). Incorporation (in both scopoletin and scopolin) of only 3 deuterons from E-cinnamic-2,3,2',3',4',5',6'-d7 and E-cinnamic-3,2',3',4',5',6'-d6 is strong support that the E-Zisomerisation step is enzymatic and not photochemical. There are three hypothetical pathways for the biosynthesis of scopoletin via: 2',4'-dihydroxycinnamate, caffeate, or ferulate. High incorporation of label from p-coumaric-2-13C, caffeic-2-13C and ferulic-2-13C acids was observed into labelled scopoletin and scopolin while there was only a small incorporation from 18O-umbelliferone and 18O-esculetin. We conclude that the major biosynthetic pathway to scopoletin and scopolin is via ferulic acid. C18O2-enrichment of E-cinnamic and ferulic acids and feeding gave scopoletin containing only one 18O-labelled oxygen atom. Therefore the lactonisation step is through o-hydroxylation and not via a postulated spirolactone-dienone intermediate. These results were confirmed by feeding experiments in an atmosphere of 18O2-air which showed that the major isotopic peak was 18O3-enriched scopoletin. Three glucosyltransferases were isolated and identified from a cassava PPDrelated cDNA library. These genes are expressed in the cassava storage root during PPD and they are also expressed in the fresh root. While one of these glucosyltransferases was novel, two had previously been isolated from cassava cotyledons.

Secondary-Metabolite Biosynthesis and Metabolism Feb 26 2023 This book was developed from the proceedings of the American Chemical Society, Division of Agricultural & Food Chemistry, subdivision of Natural Products Symposium "Biosynthesis and Metabolism of Secondary Natural Products" held in Atlanta, Georgia, April 1991. The objective of the conference was to bring together people from apparently diverse fields, ranging from biotechnology, metabolism, mechanistic organic chemistry, enzymology, fermentation, and biosynthesis, but who share a common interest in either the biosynthesis or the metabolism of natural products. It is our intention to help bridge the gap between the fields of mechanistic bio-organic chemistry and biotechnology. Our thanks go to Dr. Henry Yokoyama, co-organizer of the symposium, the authors who so kindly contributed chapters, the conference participants, and to those who assisted in the peer review process. We also thank the financial supporters of the symposium: ACS/AGFD, NIH General Medical Sciences, and the agricultural, pharmaceutical, biotechnology, and

chromatography companies. A full list of the supporting corporations and institutions is given on the following page. Pharma-Tech and P.C., Inc. are manufacturers of instrumentation for high-speed countercurrent chromatography. We thank the Agricultural Research Service and the U. S. Department of Agriculture for granting me permission to co-organize the conference and for us to complete the book. Richard J. Petroski Susan P. McCormick USDA, ARS, National Center for Agricultural Utilization Research Peoria, IL 61604 June 10, 1992 vii CONTENTS ANTIBIOTICS Polyketide Synthetases: Enzyme Complexes and Multifunctional Proteins Directing the Biosynthesis of Bacterial Metabolites from Fatty Acids. . . . . 3 . . . . . .

The Biosynthesis of Secondary Metabolites Nov 23 2022 This is a book about experiments and results of experiments. The results described are the fruit of thirty years' labour in the field of secondary metabolism. Secondary metabolism, more than any other part of the chemistry of life, has been the special preserve of organic chemists. Investiga tion of secondary metabolism began with curiosity about the struc tures of compounds isolated from natural sources, i.e. secondary metabolites. Coeval with structure determination there has been a curiosity about the origins and mechanism of formation of secondary metabolites (or natural products as they have been called). It is the experimental outcome of this curiosity that is described here. This account is primarily intended to be an introduction to the biosynthesis of secondary metabolites. I have also endeavoured, however, to make the book as comprehensive as possIble. This has meant that some of the material has had to be presented in abbrevi ated form. The abbreviated material is largely confined to particular sections of the book. The paragraphs marked with a dagger (t) can be omitted by the reader wishing to acquire a general introduction to the subject. A blend of the most significant and the most recent references is cited to provide the reader with ready access to the primary litera ture. This is clearly most necessary for the material presented in abbreviated form. Relevant reviews are also cited.

Development of Bioinformatic Methods for the Prediction and Understanding of Biosynthesis and Activity of Natural Products Sep 28 2020 Abstract: Natural products represent a valuable source for novel drugs and therapeutics. Rapid pro- gresses in computer technology, allow for the generation of knowledge about natural product biosynthesis and activity by investigation of large biological datasets. In this thesis bioinfor- matic know-how and machine learning algorithms were applied to develop methods for the prediction of secondary metabolite scaffolds based on their encoding biosynthetic gene clus- ter. Furthermore, the potential to predict the B cell and T cell epitope activity of non-peptidic molecules was explored. In order to connect biosynthetic gene clusters with their produced secondary metabolites the Secondary Metabolite Prediction and Identification pipeline (SeMPI) was developed. SeMPI v1 could predict polyketides (PK) of type I modular. The predicted scaffolds were screened in the StreptomeDB v2 in order to identify similar known secondary metabolites. Therefore, a novel algorithm was designed which allowed for the extraction of the putative initially biosynthesized carbon-chain of a secondary metabolite. In a benchmark based on the ranking power of annotated natural products, SeMPI v1 could outperform state-of-the-art biosynthetic gene cluster scaffold prediction software. The update SeMPI v2 was extended by nonribosomal peptide (NRP) and PK-NRP hy- brid predictions. The bottleneck in NRP scaffold generation is given by the prediction of the correct adenylation (A) domain substrate. To increase the prediction performance, a large selection of annotated A domains with known substrates was collected. The database scope was increased by 7 publicly available natural compound related libraries, which allows for the screening of almost 190,000 compounds. Additionally, SeMPI v2 includes the predic- tion of post-synthetic modifications, which were added to the screening process. Furthermore, the database screening was

optimized using a benchmark, based on 559 biosynthetic gene clusters with annotated secondary metabolites. The same benchmark was applied to compare SeMPI v2 to the secondary metabolite scaffold prediction server antiSMASH v5. SeMPI v2 performed similar or better in all compared categories. SeMPI v2 provides a so- phisticated web server, including a genome browser, a molecular workbench and a prepro- cessed database. The genome browser allows for the observation of biosynthetic domains, modules and clusters in a visual overview. The molecular workbench enables the modifi- cation of predicted scaffolds before submission to the database screening. The molecular workbench can also be used to submit scaffolds to the screening without prior processing of a biosynthetic gene cluster. The preprocessed database includes biosynthetic gene clusters from the Minimum Information about a Biosynthetic Gene Cluster (MIBiG) database as well as a selection of streptomyces genomes. In order to identify novel A domain specificities based on the production of so far un- characterized A domains a cooperation project with the group of Prof. Dr. Helge Bode at the university of Frankfurt was initiated. Bode et al. developed a novel NRP production system, with the potential to rapidly identify the substrate specificities of A domains for the genera photorhabdus and xenorhabdus. In order to use this system to identify so far un- characterized A domain specificities, the available space of photorhabdus and xenorhabdus A domains was collected. The sequences were phylogenetically investigated and promising domains, with a high potential to encode for novel specificities, were selected. The results of the production experiments are pending. Different functionalities of protein subfamilies, such as the substrate specificity of A and acyltransferase (AT) domains, are associated with subfamily specific residues (SSRs). In order to allow researches a thorough analysis of protein subfamilies the Subfamily Spe- cific Residue vizualization toolbox (SSR-viz) was developed. SSR-viz uses a novel algo- rithm, which allows for the detection of SSRs based on different detection strategies. The performance of the tool was benchmarked using a dataset of 20 protein subfamilies with experimental validated SSRs. SSR-viz performed comparable to state-of-the-art software and could outperform all other tools in 4 cases. The graphical user interface of SSR-viz combines various features for the detection and visualization of SSRs. The expertise in cheminformatics and machine learning collected during the work on the aforementioned projects could be applied in a methodically related cooperation project con- ducted in the work group of Prof. Dr. Björn Peters at the La Jolla Institute of Immunology (LJI) in California. The adaptive immune system relies on the identification of pathogens based on the recognition of epitopes by T cell receptors, B cell receptors and antibodies. Apart from peptidic epitopes, various non-peptidic epitopes have been described. In order to analyze the potential of non-peptidic molecules to induce an immune response, a tool was developed which allows for the prediction of non-peptidic epitopes. The built machine learning models were thoroughly benchmarked and the prediction logic was investigated in an immunological context

Antibiotics and Other Secondary Metabolites: Biosynthesis and Production Aug 20 2022

Secondary Metabolites Oct 10 2021 This book consists of an introductory overview of secondary metabolites, which are classified into four main sections: microbial secondary metabolites, plant secondary metabolites, secondary metabolites through tissue culture technique, and regulation of secondary metabolite production. This book provides a comprehensive account on the secondary metabolites of microorganisms, plants, and the production of secondary metabolites through biotechnological approach like the plant tissue culture method. The regulatory mechanisms of secondary metabolite production in plants and the pharmaceutical and other applications of various secondary metabolites are also highlighted. This book is considered as necessary reading for microbiologists, biotechnologists, biochemists, pharmacologists, and

botanists who are doing research in secondary metabolites. It should also be useful to MSc students, MPhil and PhD scholars, scientists, and faculty members of various science disciplines.

Biocontrol Agents and Secondary Metabolites Dec 20 2019 Biocontrol and Secondary Metabolites: Applications and Immunization for Plant Growth and Protection covers established and updated research on emerging trends in plant defense signaling in, and during, stress phases. Other topics cover growth at interface as a sustainable way of life and the context of human welfare and conservation of fungi as a group of organisms. Further, the book explores induced systemic resistance using biocontrol agents and/or secondary metabolites as a milestone for sustainable agricultural production, thus providing opportunities for the minimization or elimination of the use of fungicides. Presents an overview on mechanisms by which plants protect themselves against herbivory and pathogenic microbes Identifies the use of immunization as a popular and effective alternative to chemical pesticides Explores how these fungi help crop plants in better uptake of soil nutrients, increase soil fertility, produce growth promoting substances, and secrete metabolites that act as bio-pesticides

Flavonoids: From Biosynthesis and Metabolism to Health Benefits Mar 15 2022

The Biosynthesis of Secondary Metabolites Jan 25 2023 This is a book about experiments and results of experiments. The results described are the fruit of thirty years' labour in the field of secondary metabolism. Secondary metabolism, more than any other part of the chemistry of life, has been the special preserve of organic chemists. Investiga tion of secondary metabolism began with curiosity about the struc tures of compounds isolated from natural sources, i.e. secondary metabolites. Coeval with structure determination there has been a curiosity about the origins and mechanism of formation of secondary metabolites (or natural products as they have been called). It is the experimental outcome of this curiosity that is described here. This account is primarily intended to be an introduction to the biosynthesis of secondary metabolites. I have also endeavoured, however, to make the book as comprehensive as possIble. This has meant that some of the material has had to be presented in abbrevi ated form. The abbreviated material is largely confined to particular sections of the book. The paragraphs marked with a dagger (t) can be omitted by the reader wishing to acquire a general introduction to the subject. A blend of the most significant and the most recent references is cited to provide the reader with ready access to the primary litera ture. This is clearly most necessary for the material presented in abbreviated form. Relevant reviews are also cited.

Biosynthesis and Molecular Genetics of Fungal Secondary Metabolites, Volume 2 Oct 22 2022 ?Fungi produce many chemically diverse secondary metabolites whose biological roles largely remain elusive. Within the increasing number of sequenced fungal genomes several important genes involved in secondary metabolite formation have been identified. Most of these genes are clustered and their coordinated transcription is controlled in a complex way by both narrow pathway-specific regulators as well as broad global transcription factors responsive to environmental cues. In recent years it was discovered many of the newly identified gene clusters are silent under laboratory conditions suggesting that the biosynthetic potential of fungi is far from being exploited. Besides identifying novel bioactive metabolites from still unexplored sources, the activation of these gene clusters by several approaches may result in the discovery of new substances with antibiotic and pharmaceutical benefits. This book covers recent advances in the field of fungal secondary metabolisms ranging from methodologies to biological aspects and will include the latest knowledge on fungal molecular biology, genomics, and metabolomics. With the related volume by Professor Juan-Francisco Martin, where the most relevant and well-studied fungal secondary metabolites are compiled, this

book provides a comprehensive overview of the state-of-the-art of research on fungal secondary metabolites.