

# Production, Purification and Characterization of Inulinase from a Newly Isolated *Streptomyces* sp. CP01

Nirobol Laowklom, Rungtrakarn Chantanaphan, Pairoh Pinphanichakarn

Department of Microbiology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand.  
Email: Pairoh.P@Chula.ac.th

Received March 6<sup>th</sup>, 2012; revised April 9<sup>th</sup>, 2012; accepted April 23<sup>rd</sup>, 2012

## ABSTRACT

Inulinase is an enzyme catalyzing the hydrolysis of inulin, a plant reserve polysaccharide, into fructoses and fructo-oligosaccharides which are widely used as food additives. Here we report inulinase from a newly isolated *Streptomyces* as in the past decade there have been very few reports on inulinases from *Streptomyces*, especially purification and characterization of these enzymes. Out of 371 *Streptomyces* isolates, *Streptomyces* sp. CP01 produced highest inulinase activity of 0.50 U/ml. The enzyme activity was increased to 1.60 U/ml when CP01 was cultivated under the optimal conditions which consisted of using basal medium (Czapek's Dox) containing 1% (w/v) inulin extract from *Jerusalem artichoke's* root tubers and 0.7% (w/v) tryptone at pH8, shaking at 200 rpm and 28°C for 24 h. The enzyme was purified from culture filtrate to about 67-fold purity by  $(\text{NH}_4)_2\text{SO}_4$  precipitation followed by four consecutive column chromatography steps. The purified enzyme is a single peptide with approximate molecular mass of 73 kDa as analyzed by gel filtration and 70.8 kDa as assessed by SDS-PAGE. The enzyme is optimally active at 55°C and pH 6.0, however it still possesses more than 80% of the maximal activity at pH ranging from 5.5 to 9.0. It is stable at temperature up to 50°C and at broad range of pH from 5.0 to 9.0 for 30 min. Its  $K_m$  and  $V_{max}$  values for inulin were 2.34 mM and 440  $\mu\text{mol}\cdot\text{min}^{-1}\cdot\text{mg}^{-1}$ , respectively. This enzyme has potential for industrial application as it is active at moderately high temperature and wide range of pH.

**Keywords:** Characterization; Inulinase; Production; Purification; *Streptomyces*

## 1. Introduction

Inulin is a polyfructan in plant consisting of linear chains  $\beta$ -D(2,1)-linked fructose residues attached to a terminal sucrose molecule [1]. It is a reserve as a storage carbohydrate and accumulated in the underground organ of several plants such as *Jerusalem artichoke* (*Helianthus tuberosus*), chicory (*Cichorium intybus*), dahlia (*Dahlia pinnata*) and dandelion (*Taraxacum officinale*) [2,3]. As it is abundantly available in nature and having fructose as its major composition, therefore it is suitable to be used as a substrate for fructo-oligosaccharides and high fructose syrup production for food, drink and pharmaceutical industries [4]. Moreover, fructose is also used as a substrate for bioethanol fermentation as renewable energy source by *Saccharomyces cerevisiae* and *Zymomonas mobilis* [5].

There have been reports of inulinase, an enzyme catalyzing the hydrolysis of inulin, from many microorganisms including *Aspergillus niger* NK-126, *Kluyveromyces marxianus* YS-1, *Bacillus subtilis* T7, *Kluyveromyces* sp. Y-85, a mutant of the marine yeast *Pichia galliermondii*, *Staphylococcus* sp. and *Kluyveromyces marxi-*

*anus* ATCC 52466 [6-11]. However, there was only few reports on inulinases from *Streptomyces* [12,13]. It is well known that several *Streptomyces* species produce a great variety of useful bioactive metabolites, including antibiotics, anticancer agents, insecticides, enzyme inhibitors and industrial important enzymes. *Streptomyces* species are soil bacteria found in different environments around the world, thus the enzymes produced by these microorganisms should be active under various environments corresponding to the habitats where they are isolated. Here, we report isolation of *Streptomyces* from Thai-soil which is located in the tropical zone and screening for inulinase-producing ability of the isolates. Optimization of inulinase-production by the selected strain, purification and characterization of the enzyme are also included.

## 2. Materials and Methods

### 2.1. Materials

Inulin from chicory root was purchased from Sigma-Aldrich (Saint Louis, MO). The chromatography unit used for protein purification was the model Bio-Logic LP

# Production Purification And Characterization Of Inulinase

**Padhraic Smyth**



## **Production Purification And Characterization Of Inulinase:**

This is likewise one of the factors by obtaining the soft documents of this **Production Purification And Characterization Of Inulinase** by online. You might not require more era to spend to go to the books inauguration as well as search for them. In some cases, you likewise attain not discover the declaration Production Purification And Characterization Of Inulinase that you are looking for. It will totally squander the time.

However below, following you visit this web page, it will be hence agreed simple to get as well as download lead Production Purification And Characterization Of Inulinase

It will not say yes many become old as we accustom before. You can attain it though action something else at house and even in your workplace. appropriately easy! So, are you question? Just exercise just what we manage to pay for below as well as evaluation **Production Purification And Characterization Of Inulinase** what you next to read!

<https://db1.greenfirefarms.com/public/detail/HomePages/Affordable%20Digital%20Nomad%20Visa%20Guide%202619.pdf>

## **Table of Contents Production Purification And Characterization Of Inulinase**

1. Understanding the eBook Production Purification And Characterization Of Inulinase
  - The Rise of Digital Reading Production Purification And Characterization Of Inulinase
  - Advantages of eBooks Over Traditional Books
2. Identifying Production Purification And Characterization Of Inulinase
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Production Purification And Characterization Of Inulinase
  - User-Friendly Interface
4. Exploring eBook Recommendations from Production Purification And Characterization Of Inulinase

- Personalized Recommendations
  - Production Purification And Characterization Of Inulinase User Reviews and Ratings
  - Production Purification And Characterization Of Inulinase and Bestseller Lists
5. Accessing Production Purification And Characterization Of Inulinase Free and Paid eBooks
    - Production Purification And Characterization Of Inulinase Public Domain eBooks
    - Production Purification And Characterization Of Inulinase eBook Subscription Services
    - Production Purification And Characterization Of Inulinase Budget-Friendly Options
  6. Navigating Production Purification And Characterization Of Inulinase eBook Formats
    - ePub, PDF, MOBI, and More
    - Production Purification And Characterization Of Inulinase Compatibility with Devices
    - Production Purification And Characterization Of Inulinase Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Production Purification And Characterization Of Inulinase
    - Highlighting and Note-Taking Production Purification And Characterization Of Inulinase
    - Interactive Elements Production Purification And Characterization Of Inulinase
  8. Staying Engaged with Production Purification And Characterization Of Inulinase
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Production Purification And Characterization Of Inulinase
  9. Balancing eBooks and Physical Books Production Purification And Characterization Of Inulinase
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Production Purification And Characterization Of Inulinase
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Production Purification And Characterization Of Inulinase
    - Setting Reading Goals Production Purification And Characterization Of Inulinase
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Production Purification And Characterization Of Inulinase

- Fact-Checking eBook Content of Production Purification And Characterization Of Inulinase
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

### **Production Purification And Characterization Of Inulinase Introduction**

In the digital age, access to information has become easier than ever before. The ability to download Production Purification And Characterization Of Inulinase has revolutionized the way we consume written content. Whether you are a student looking for course material, an avid reader searching for your next favorite book, or a professional seeking research papers, the option to download Production Purification And Characterization Of Inulinase has opened up a world of possibilities. Downloading Production Purification And Characterization Of Inulinase provides numerous advantages over physical copies of books and documents. Firstly, it is incredibly convenient. Gone are the days of carrying around heavy textbooks or bulky folders filled with papers. With the click of a button, you can gain immediate access to valuable resources on any device. This convenience allows for efficient studying, researching, and reading on the go. Moreover, the cost-effective nature of downloading Production Purification And Characterization Of Inulinase has democratized knowledge. Traditional books and academic journals can be expensive, making it difficult for individuals with limited financial resources to access information. By offering free PDF downloads, publishers and authors are enabling a wider audience to benefit from their work. This inclusivity promotes equal opportunities for learning and personal growth. There are numerous websites and platforms where individuals can download Production Purification And Characterization Of Inulinase. These websites range from academic databases offering research papers and journals to online libraries with an expansive collection of books from various genres. Many authors and publishers also upload their work to specific websites, granting readers access to their content without any charge. These platforms not only provide access to existing literature but also serve as an excellent platform for undiscovered authors to share their work with the world. However, it is essential to be cautious while downloading Production Purification And Characterization Of Inulinase. Some websites may offer pirated or illegally obtained copies of copyrighted material. Engaging in such activities not only violates copyright laws but also undermines the efforts of authors, publishers, and researchers. To ensure ethical downloading, it is advisable to utilize reputable websites that

prioritize the legal distribution of content. When downloading Production Purification And Characterization Of Inulinase, users should also consider the potential security risks associated with online platforms. Malicious actors may exploit vulnerabilities in unprotected websites to distribute malware or steal personal information. To protect themselves, individuals should ensure their devices have reliable antivirus software installed and validate the legitimacy of the websites they are downloading from. In conclusion, the ability to download Production Purification And Characterization Of Inulinase has transformed the way we access information. With the convenience, cost-effectiveness, and accessibility it offers, free PDF downloads have become a popular choice for students, researchers, and book lovers worldwide. However, it is crucial to engage in ethical downloading practices and prioritize personal security when utilizing online platforms. By doing so, individuals can make the most of the vast array of free PDF resources available and embark on a journey of continuous learning and intellectual growth.

## **FAQs About Production Purification And Characterization Of Inulinase Books**

1. Where can I buy Production Purification And Characterization Of Inulinase books? Bookstores: Physical bookstores like Barnes & Noble, Waterstones, and independent local stores. Online Retailers: Amazon, Book Depository, and various online bookstores offer a wide range of books in physical and digital formats.
2. What are the different book formats available? Hardcover: Sturdy and durable, usually more expensive. Paperback: Cheaper, lighter, and more portable than hardcovers. E-books: Digital books available for e-readers like Kindle or software like Apple Books, Kindle, and Google Play Books.
3. How do I choose a Production Purification And Characterization Of Inulinase book to read? Genres: Consider the genre you enjoy (fiction, non-fiction, mystery, sci-fi, etc.). Recommendations: Ask friends, join book clubs, or explore online reviews and recommendations. Author: If you like a particular author, you might enjoy more of their work.
4. How do I take care of Production Purification And Characterization Of Inulinase books? Storage: Keep them away from direct sunlight and in a dry environment. Handling: Avoid folding pages, use bookmarks, and handle them with clean hands. Cleaning: Gently dust the covers and pages occasionally.
5. Can I borrow books without buying them? Public Libraries: Local libraries offer a wide range of books for borrowing. Book Swaps: Community book exchanges or online platforms where people exchange books.
6. How can I track my reading progress or manage my book collection? Book Tracking Apps: Goodreads, LibraryThing, and Book Catalogue are popular apps for tracking your reading progress and managing book collections. Spreadsheets:

You can create your own spreadsheet to track books read, ratings, and other details.

7. What are Production Purification And Characterization Of Inulinase audiobooks, and where can I find them?  
Audiobooks: Audio recordings of books, perfect for listening while commuting or multitasking. Platforms: Audible, LibriVox, and Google Play Books offer a wide selection of audiobooks.
8. How do I support authors or the book industry? Buy Books: Purchase books from authors or independent bookstores. Reviews: Leave reviews on platforms like Goodreads or Amazon. Promotion: Share your favorite books on social media or recommend them to friends.
9. Are there book clubs or reading communities I can join? Local Clubs: Check for local book clubs in libraries or community centers. Online Communities: Platforms like Goodreads have virtual book clubs and discussion groups.
10. Can I read Production Purification And Characterization Of Inulinase books for free? Public Domain Books: Many classic books are available for free as they're in the public domain. Free E-books: Some websites offer free e-books legally, like Project Gutenberg or Open Library.

## **Find Production Purification And Characterization Of Inulinase :**

**affordable digital nomad visa guide 26192**

*expert anti inflammatory diet for beginners 24289*

affordable ai video generator usa 25006

**how to home workout explained 24568**

~~pro budgeting tips 2025 for beginners 24501~~

**what is budgeting tips ideas 26306**

**pro ai tools for moms 25833**

**best index fund investing 2025 23595**

**pro index fund investing explained 25926**

*affordable minimalist lifestyle tips for beginners 25734*

*simple ai tools explained 24081*

**top side hustles online for experts 24179**

**expert capsule wardrobe tips for beginners 23298**

expert budgeting tips online 25273

*simple budgeting tips ideas for students 25946*

## Production Purification And Characterization Of Inulinase :

ADVANCED ACCOUNTING-W/ACCESS This view equips students to analyze and assess future reporting developments. This book is the product of extensive market research including focus groups, ... Advanced Accounting Hamlen Huefner Largay Second ... A book that does not look new and has been read but is in excellent condition. No obvious damage to the cover, with the dust jacket (if applicable) included ... Advanced Accounting 2nd (second) Edition by Hamlen ... Advanced Accounting 2nd (second) Edition by Hamlen, Huefner, Largay published by Cambridge Business Publishers (2013) on Amazon.com. Advanced Accounting, 5e Professor Hamlen is the author of Advanced Accounting 4e and previously co-authored 12 editions of advanced accounting texts. She has taught courses in ... Susan Hamlen | Get Textbooks (2nd Edition) Advanced Accounting (Second Edition) by Ronald J. Huefner, Susan S. Hamlen, James A. Largay Hardcover, 703 Pages, Published 2014 by Cambridge ... Advanced Accounting - By Susan S. Hamlen Advanced Accounting by By Susan S. Hamlen - ISBN 10: 1618532618 - ISBN 13 ... "synopsis" may belong to another edition of this title. PublisherCambridge ... Hamlen Hamlen | Get Textbooks Title(2nd Edition) Advanced Accounting (Second Edition) by Ronald J. Huefner, Susan S. Hamlen, James A. Largay Hardcover, 703 Pages, Published 2014 by ... Advanced Accounting by Huefner Largay Hamlen Free Shipping - ISBN: 9781618530059 - 2nd Edition - Hardcover - Cambridge Business Publishers - 2013 - Condition: New - New! This book is in the same ... Test Bank For Advanced Accounting 2nd Edition Hamlen What is the entry to record receipt of interest and principal on December 31, 2016, assuming no impairment on the bond throughout its life? a. Cash 104,000 Susan Hamlen Solutions Advanced Accounting 4th Edition 110 Problems solved, Susan Hamlen. Advanced Accounting 2nd Edition T. Watson: Photographer of Lythe, near Whitby, est. 1892 T. Watson: Photographer of Lythe, near Whitby, est. 1892. 5.0 5.0 out of 5 stars 1 Reviews. T. Watson: Photographer of Lythe, near Whitby, est. 1892. T.Watson 1863-1957 Photographer of Lythe Near Whitby T.Watson 1863-1957 Photographer of Lythe Near Whitby. 0 ratings by Goodreads · Richardson, Geoffrey. Published by University of Hull Press, 1992. T.Watson 1863-1957 Photographer of Lythe, near Whitby. A well produced 146 pp. monograph on Thomas Watson.A professional photographer and contemporary of Frank Meadow Sutcliffe working in the same location. T.Watson 1863-1957 Photographer of Lythe Near Whitby T.Watson 1863-1957 Photographer of Lythe Near Whitby ... Only 1 left in stock. ... Buy from the UK's book specialist. Enjoy same or next day dispatch. A top-rated ... T.Watson 1863-1957 Photographer of Lythe Near Whitby T.Watson 1863-1957 Photographer of Lythe Near Whitby by Geoffrey Richardson (Paperback, 1992). Be the first to write a review. ... Accepted within 30 days. Buyer ... Nostalgic North Riding ... Watson, Lythe Photographer. Thomas Watson was born in Ruswarp in 1863 but was moved to Lythe, just east of Sandsend, a couple of years later. Nostalgic North Riding | In this short film, Killip presents a ... Thomas Watson was born in Ruswarp in 1863 but was moved to Lythe, just east of Sandsend, a couple of years later. He went to work at Mulgrave ... Thomas Watson's photographic studio, Lythe near Whitby, ... Mar 16, 2011 — Thomas Watson's photographic studio, Lythe near

Whitby, in 2008. Look at the terrible state of the wooden sheds that once comprised the ... Souvenir of.SANDSEND and Neighbourhood. ... Souvenir of.SANDSEND and Neighbourhood. Photographic Views of Sandsend Photographed and Published by T.Watson, Lythe. Watson, Thomas 1863-1957: Editorial: W & T ... Health Care USA: Understanding Its... by Sultz, Harry Book details ; ISBN-10. 1284002802 ; ISBN-13. 978-1284029888 ; Edition. 8th ; Publisher. Jones & Bartlett Learning ; Publication date. July 19, 2013. Health Care USA: Understanding Its Organization and ... Health Care USA, Eighth Edition Includes Navigate Advantage Access, offers students of health administration, public health, medicine, and related fields a ... Health Care USA: Understanding Its Organization and ... Health Care USA: Understanding Its Organization and Delivery, 8th Edition by Sultz, Harry - ISBN 10: 1284029883 - ISBN 13: 9781284029888 - Jones & Bartlett ... Health Care USA: Understanding Its Organization and ... Health Care USA, Eighth Edition Includes Navigate Advantage Access, offers students of health administration, public health, medicine, and related fields a ... Health Care USA 8th edition 9781284029888 1284029883 Health Care USA: Understanding Its Organization and Delivery · 8th edition · 978-1284029888 · Paperback/softback · Jones & Bartlett (7/19/2013). Health Care USA: Understanding Its Organization and ... Health Care USA, Eighth Edition, offers students of health administration, public health, medicine, and related fields a wide-ranging overview of America's ... Sultz and Young's Health Care USA: Understanding Its ... Sultz and Young's Health Care USA: Understanding Its Organization and Deliveryselected product title. Tenth Edition. James A. Johnson, PhD, MPA, MSc; Kimberly ... Health Care USA: Understanding Its Organization and ... Health Care USA: Understanding Its Organization and Delivery, 8th Edition ; No reviews yet Write a review ; Subscribe to Discover Books. Exclusive discount codes, ... Health Care USA book by Kristina M Young Health Care USA: Understanding Its Organization and Delivery, 8th Edition. Kristina M. Young, Harry A. Sultz. Health Care USA: Understanding Its Organization and ... Health Care USA: Understanding Its Organization and Delivery, 8th Edition by Su ; Condition. Brand New ; Quantity. 1 available ; Item Number. 335124557461 ; ISBN.