

Produksi Enzim Selulase oleh *Aspergillus niger* pada Ampas Sagu

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Diterima 1-04-2014 Disetujui 22-10-2014

ABSTRACT

Production of cellulase by *Aspergillus niger* was carried out by growing the culture on sago waste. Sago waste contains cellulose that has not been used optimally. Cellulose is a polysaccharide consisting of glucose monomers linked by α -1,4-glycosides bonds. Glycoside bonds in cellulose can be enzymatically hydrolyzed into glucose with cellulase enzymes. Solid fermentation used to produce cellulase on sago waste as substrate was influenced by pH (3 to 6), moisture content (40% to 85%), and fermentation time (4 to 10 days). Products of the cellulase enzyme activity was measured by phenol-sulfuric acid method. The results showed that the highest cellulase enzyme activity was 0.172 U/mL obtained at 85% moisture content, pH 5, and 8 days of fermentation time.

Keywords: *Aspergillus niger*, cellulase, sago waste

ABSTRAK

Produksi enzim selulase oleh *Aspergillus niger* pada ampas sagu telah dilakukan. Ampas sagu adalah salah satu bahan yang mengandung selulosa di mana ampas sagu belum dimanfaatkan secara optimal. Selulosa merupakan polisakarida yang terdiri atas monomer glukosa yang dihubungkan oleh ikatan α -1,4-glikosida. Ikatan glikosida pada selulosa dapat dihidrolisis menjadi glukosa secara enzimatis dengan enzim selulase. Fermentasi padat digunakan untuk menghasilkan enzim selulase pada substrat ampas sagu yang dipengaruhi oleh faktor pH (3 sampai 6), kadar air (40% sampai 85%) dan waktu fermentasi (4 sampai 10 hari). Produk aktivitas enzim selulase diukur dengan metode fenol-asam sulfat. Hasil penelitian menunjukkan bahwa aktivitas enzim selulase tertinggi adalah 0,172 U/mL yang diperoleh pada kadar air 85%, pH 5, dan waktu fermentasi 8 hari.

Kata Kunci: Ampas sagu, *Aspergillus niger*, Selulase

PENDAHULUAN

Enzim selulase merupakan enzim yang dapat menghidrolisis ikatan α -1,4 pada selulosa. Adanya selulosa dalam suatu substrat dapat menginduksi terbentuknya enzim selulase oleh mikroorganisme selulolitik. Mikroorganisme selulolitik yang dapat digunakan untuk menghasilkan enzim selulase misalnya kapang *Aspergillus niger* (Ul-haq *et al.* 2005).

Substrat yang digunakan untuk memproduksi enzim selulase adalah substrat berbahan lignoselulosa. Substrat lignoselulosa yang telah diteliti dengan kapang *A. niger* yaitu jerami padi (Sa'adah *et al.* 2008), serbuk gergaji kayu (Guruchandran & Sasikumar 2010; Acharya *et al.* 2008), ampas tebu (Guruchandran & Sasikumar 2010), tandan pisang (Retnoningtyas *et al.* 2006), jerami gandum (Jecu 2000), kulit gandum (Jecu 2000), dan ampas singkong (Pothiraj *et al.* 2006).

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Journal Internasional Enzim

Aji Sutrisno,Agustin Krisna Wardani



Journal Internasional Enzim:

Pangan Untuk Sistem Imun Alberta Rika Pratiwi, dkk, SINOPSIS Buku berjudul Pangan untuk Sistem Imun ini mencoba dibuat untuk menjadi sumber belajar yang berasal dari para ahli yang menekuni Ilmu dan Teknologi Pangan di Jawa Tengah Ada 26 judul tulisan yang berisi informasi tentang kandungan atau komponen komponen penting yang berasal dari berbagai sumber pangan yang memiliki fungsi dan manfaat yang dapat diimplementasikan untuk seseorang sehingga menjadi lebih sehat dan tahan terhadap sakit Dari dua puluh enam artikel disajikan dalam 7 tema Tema 1 MEMILIH MAKAN IDEAL Tema 2 MIKROBA BAIK UNTUK SISTEM IMUN Tema 3 BERKAT SAYUR DAN BUAH MENJADI SEHAT Tema 4 HERBAL DAN DAYA TAHAN TUBUH Tema 5 SEHAT DENGAN CEREAL Tema 6 HEBATNYA UMBI Tema 7 PANGAN HEWANI YANG MENYEHATKAN

Detox is Easy Rita Ramayulis, DCN., M.Kes.,2014 Anda merasa mudah sakit dan badan sering tidak fit Bingung bagaimana caranya mengembalikan vitalitas tubuh Anda Cara mudah yang bisa Anda lakukan adalah dengan detoks Pada awalnya metode detoks hanya dengan cara megonsumsi air putih buah dan sayur Namun apakah hanya itu saja Padahal sebenarnya tubuh memiliki kemampuannya sendiri untuk mendetoksifikasi racun racun dari dalam tubuh Buku ini menyajikan berbagai macam cara detoks racun yang mudah dan ampuh Semua ragam cara detoksifikasi yang disajikan dalam buku ini sudah dipraktikkan langsung oleh penulis dan hasilnya sudah pasti POSITIF SALAM PENEBAR PLUS

Pengantar Rekayasa Genetika Aji Sutrisno,Agustin Krisna Wardani,2023-12-31 Rekayasa genetika atau teknologi DNA rekombinan adalah teknologi manipulasi modifikasi dan rekombinasi DNA atau molekul asam nukleat lainnya untuk memodifikasi suatu organisme atau populasi organisme Rekayasa genetika telah membantu para peneliti dalam pengembangan penelitian dasar di bidang biokimia biologi molekuler dan genetika Rekayasa genetika telah menunjukkan manfaat dalam membawa kemajuan dalam kehidupan manusia Teknologi ini memiliki penerapan multidisiplin dan telah menghasilkan produk produk yang penting kehidupan manusia di bidang kesehatan pertanian dan lingkungan Buku Pengantar Rekayasa Genetika ini disusun sebagai upaya untuk memberikan gambaran secara umum kepada pelajar mahasiswa Indonesia tentang rekayasa genetika dan perannya dalam kehidupan sehari hari Buku ini terdiri dari tiga bagian yaitu dasar dasar rekayasa genetika metodologi modifikasi gen yang berisikan tentang teknik teknik rekayasa genetika dan aplikasi rekayasa genetika pada berbagai bidang terpilih Penyusun berharap dengan adanya buku ini akan dapat memberikan informasi dan wawasan yang utuh tentang rekayasa genetika potensi serta manfaatnya dalam kehidupan sehari hari Semoga buku ini memberikan manfaat bagi semua pihak serta memberikan manfaat untuk kemajuan bioteknologi dan bidang terkait di Indonesia

Kosmetik Alam: Tongkol Jagung Sebagai Whitening Agent Indri Kusuma Dewi,Suwijiyo Pramono,Abdul Rohman,Ronny Martien,2022-01-04 Jagung merupakan tanaman pangan yang menghasilkan tongkol jagung sebagai limbah yang tak termanfaatkan Oleh karena itu perlu pemanfaatan tongkol jagung dalam formula optimum sebagai inhibitor tirosinase Buku ini bertujuan untuk menginformasikan uji penghambatan enzim tirosinase formula optimum fraksi

tongkol jagung Tongkol jagung diekstraksi dengan metode maserasi menggunakan pelarut etanol 70 % kemudian dipartisi dengan kloroform etil asetat dan air sehingga menghasilkan 3 fraksi yaitu fraksi kloroform fraksi etil asetat dan fraksi air Ketiga fraksi dianalisis uji inhibitor tirosinase dengan metode penghambatan enzim tirosinase secara in vitro dan aktivitas antioksidan menggunakan uji penangkapan radikal DPPH 2,2-difenil-1-pikrilhidrazil Uji kandungan fenolik total dan flavonoid total menggunakan spektrofotometri UV-Vis Fraksi terpilih selanjutnya diformulasi dalam sediaan gel dan dioptimasi dengan metode Simplex Lattice Design serta diverifikasi untuk mendapatkan formula optimum Formula optimum dilakukan pengujian stabilitas menggunakan metode freeze thaw cycling selama 4 siklus pengujian antioksidan menggunakan metode DPPH pengujian proteksi kulit secara in vitro pengujian iritasi kulit dan uji aktivitas penghambatan enzim tirosinase

Diabetes dan Rumput Laut Cokelat Muhamad Firdaus, 2017-02-01 Diabetes mellitus adalah gangguan metabolik yang ditandai dengan adanya hiperglikemik pada individu yang menderitanya Gejala gejalanya adalah polyuria polydipsia penurunan berat badan dan terkadang diikuti dengan polyphagia Kondisi hiperglikemik yang kronis akan memicu adanya penyulit diabetes pada penyandang Tindakan paling efektif untuk mencegah adanya penyulit diabetes adalah menjaga glukosa darahnya agar tetap normal Bahan bahan aktif baik dari mikroba hewan dan tumbuhan telah dibuktikan banyak yang menunjukkan fungsinya sebagai agen hipoglikemik Rumput laut cokelat adalah tanaman laut yang tumbuh baik di sekitar pantai jernih dan berkarang Secara ekologis rumput laut ini berperan sebagai tempat perlindungan ikan-ikan kecil terhadap predatornya Bagi manusia rumput laut ini banyak digunakan bagi kepentingan industri farmasi dan makanan Kandungan alginatnya telah banyak dimanfaatkan untuk keperluan tersebut Rumput laut ini juga memberikan manfaat kesehatan bagi manusia karena keberadaan polifenolnya Polifenol telah diketahui banyak berperan sebagai antidiabetes atau antihiperglikemik Bioaktif berkemampuan menghambat penyerapan glukosa oleh saluran pencernaan dan mendorong sekresi dan mengaktifkan insulin dalam tubuh Buku ini juga memberikan gambaran bahwa ekstrak rumput laut cokelat dari *Sargassum* sp mampu berperan sebagai antihiperglikemik dan sekaligus mencegah terjadinya penyulit diabetes Buku ini disusun sebagai salah satu sumber pustaka tentang pemanfaatan rumput laut cokelat hingga dapat menjadi sumber rujukan tentang pemanfaatan rumput laut ini khususnya sebagai agen antihiperglikemik Penyusunan buku ini diharapkan menjadi rekam jejak tulisan tentang salah satu pemanfaatan rumput laut cokelat khususnya dalam penanggulangan diabetes melitus

Merancang Energi Masa Depan dengan Biodiesel Eka Kurniasih, S.T., M.T., 2020-09-16 Krisis energi telah mulai melanda Indonesia khususnya sektor bahan bakar minyak dalam bidang transportasi dan industri Sementara Indonesia memiliki sumber daya alam yang potensial untuk diubah menjadi energi terbarukan salah satunya biodiesel dari minyak nabati Buku ini dapat digunakan sebagai bahan referensi bagi siapa saja yang berkecimpung dalam produksi biodiesel baik itu mahasiswa yang sedang menyelesaikan tugas akhir mengenai energi terbarukan ataupun industri yang memproduksi biodiesel Mekanisme reaksi hingga kondisi optimum untuk produksi biodiesel telah ditemukan dan dapat diaplikasikan untuk

produksi biodiesel dalam skala laboratorium ataupun pilot plant hingga industri 100 perempuan peneliti berprestasi Indonesia, 2010 Biographical sketches of 100 prominent women in science in Indonesia **Kanser Payu Dara** Dr Bruce Miller, 2016-01-01 Kanser payu dara merupakan kanser paling biasa menimpa kaum wanita Menurut perangkaan daripada National Cancer Institute di bawah kategori yang selalu mengalaminya satu orang daripada setiap lapan orang wanita menghadapi risiko kanser payu dara dalam hayat mereka Ini bukan sebuah buku untuk menakutkan anda tetapi ia bertujuan untuk melengkapi anda dengan pengetahuan yang diperlukan agar anda dapat menumpaskan kanser payu dara sebelum ia dapat menyerang anda Kanser payu dara boleh dipulihkan sekiranya ia dapat dikesan pada peringkat awal Sememangnya pengesanan awal adalah hebat sekali tetapi bagi saya adalah lebih baik jika kita menumpukan masa dan usaha untuk mencari jalan mencegahnya Apa yang paling mencemaskan pada hari ini ialah golongan yang menderita kanser payu dara menjadi semakin muda Lapan puluh hingga sembilan puluh peratus daripada semua kanser payu dara merupakan akibat daripada perkara perkara yang kita lakukan terhadap diri kita sendiri Musuhnya ialah kita sendiri Perang menentang kanser payu dara merupakan suatu peperangan yang boleh dimenangi Kita perlu hanya mengubah muslihat kita iaitu daripada mencari penyembuhan melalui peluru ajaib kita sebaliknya harus berusaha secara agresif untuk mencari pencegahan dan inilah yang menjadi fokus buku ini Saya percaya bahawa mengelakkan karsinogen yang diketahui melakukan senaman secara regular dan mencukupi memakan diet yang betul dan sekiranya perlu menambahkan diet anda itu dengan nutrien nutrien yang betul dan mewujudkan kehidupan yang ceria dan bebas daripada segala tekanan tanpa memikul sebarang beban emosi akan membantu memperkuat sistem imun anda iaitu mekanisme pertahanan badan anda untuk menentang segala penyakit Kanser merupakan sejenis penyakit sistem imun Walaupun dengan lebih tepat ia merupakan suatu penyakit akibat kelemahan sistem imun Kekuatan imun anda mesti menurun ke paras yang sangat rendah sebelum kanser dapat bertapak dan apabila ia menurun ke paras yang amat rendah dan amat lemah maka sel sel kanser mula menular Badan anda tidak ada pertahanan untuk menentangnya atau walaupun terdapat pertahanan pertahanan kecil yang masih wujud ia tidak mencukupi ujar Virginia Livingston Wheeler M D pengerang The Conquest of Cancer Beliau selanjutnya berkata Keupayaan sistem imun anda untuk mencegah kanser dengan jayanya secara langsung bergantung kepada keadaan nutrisi anda **Tempo**, 2000 *Bagaimana jantung anda diselamatkan*, 2001 *Enzyme Immobilization* Alka Dwevedi, 2016-09-15 This book covers the latest developments in enzyme immobilization with its wide applications such as for industry agriculture medicine and the environment Topics covered include basics of enzyme immobilization its implication in therapeutics and disease diagnostics and its significance in solving environmental problems This is an ideal book for researchers graduate and postgraduate students as well as scientists in industry agriculture and health sectors This book is a complete summary of enzyme immobilization and also thoroughly covers all the latest research This book covers The last one hundred years of innovative research done in enzyme immobilization Recent developments in immobilization techniques such

as types of matrices immobilization methods and linking agents as well as enzyme immobilization without any matrices and its properties The physiological and industrial significance of enzymes from plants and the implementation of immobilized enzymes in the treatment of waste water and polluted air Biomedical and bioanalytical applications of immobilized enzymes

Enzymes in Food Biotechnology Mohammed Kuddus, 2018-08-23 Enzymes in Food Biotechnology Production

Applications and Future Prospects presents a comprehensive review of enzyme research and the potential impact of enzymes on the food sector This valuable reference brings together novel sources and technologies regarding enzymes in food production food processing food preservation food engineering and food biotechnology that are useful for researchers professionals and students Discussions include the process of immobilization thermal and operational stability increased product specificity and specific activity enzyme engineering implementation of high throughput techniques screening to relatively unexplored environments and the development of more efficient enzymes Explores recent scientific research to innovate novel global ideas for new foods and enzyme engineering Provides fundamental and advanced information on enzyme research for use in food biotechnology including microbial plant and animal enzymes Includes recent cutting edge research on the pharmaceutical uses of enzymes in the food industry Polymeric Supports for Enzyme Immobilization Alka Dwevedi, 2021-06-22 Enzyme immobilization has been approached for finding solutions for various critical problems associated with industries medicine environment agriculture etc Especially since last decades several innovative researches have come up to look for enhancing catalytic efficiency reusability of immobilized enzyme and longer stability by introducing range of immobilizing supports supports modifiers through introduction of several chemical agents non toxic and adopting innovative enzyme immobilization methods In the present book polymeric supports have been focussed for enzyme immobilization especially due to their versatility in immobilizing different enzymes for different large scale enzyme reactors to be used for several applications Especially polymers can be modified according to applications and enzyme properties which have made it supports of choice for all several enzyme based applications Polymeric Supports for Enzyme Immobilization Opportunities and Applications offers in depth discussions of known polymeric enzyme support materials reaction processes and optimized methods to enhance enzyme immobilization Case based chapters examine methods of enzyme immobilization onto various polymeric supports their surface chemistry and physical morphology followed by implementation of polymers based immobilized enzymes in various applications viz medicine environment industries clean energy disease diagnosis drug delivery etc This book has prime focus to allow several researchers across the world to provide updated technological details and incite to contribute more innovative work in coming years to find solutions to several critical problems Offers an in depth case driven discussion of known polymeric enzyme support materials associated reaction processes and methods to enhance enzyme immobilization Provides optimal strategies for various enzymes processes and applications considering the enzyme itself substrate and available support properties Provides complete

details on applications of polymeric based immobilized enzymes in various applications ranging from chemical or pharmaceutical synthesis food processing bioremediation industrial catalysis etc

Enzyme Biotechnology for Environmental Sustainability Praveen Dahiya, Joginder Singh Panwar, Ajay Kumar, 2024-07-13 Enzyme Biotechnology for Environmental Sustainability discusses recent applications of enzyme biotechnology in various industrial sectors and state of the art information on novel microbial enzyme technologies for a sustainable environment The book describes in detail the latest developments and modern methods in microbial enzyme biotechnology for wider application in bioremediation cleaner technology for industries and waste management green chemistry and pharmaceutical biotechnology sustainable textiles food production and biodegradation and other industries The chapters cover topics such as genetic engineering protein engineering nanotechnological advances of microbial enzymes computational tools for engineering enzymes and health risk assessment of enzymes in different sectors With contributors from an array of experts in the field Enzyme Biotechnology for Environmental Sustainability is an informative reference for researchers biotechnologists microbiologists environmental scientists graduate and post graduate students working in the area of enzyme technology and their biomedical environmental and industrial applications Includes new methods and up to date information on modern methods with respect to its application in pharmaceuticals textiles food fermentation and many other related fields Provides in depth information about the recent applications of enzyme biotechnology in different industrial sectors Focuses on the rapid developments and biotechnological advances in microbial enzymology to enhance industrial and environmental sustainability

Kinetics of Enzymatic Synthesis Lakshmanan Rajendran, Carlos Fernandez, 2019-01-30 Kinetics of Enzymatic Synthesis gives insight into different aspects of chemical reactions that are catalyzed by enzymes This book is divided into two sections Enzyme Kinetics and Enzymatic Synthesis The first section consists of two chapters with a halophilic enzyme kinetics and thermodynamic approach towards analyzing the influence of co solvents on the Michaelis constants of enzyme catalyzed reactions The second section consists of three chapters Production of isoamyl acetate using the enzymatic synthesis method between acetic anhydride and isoamyl alcohol by having enzyme *Candida antarctica* Lipase B as catalyst in a solvent free system is discussed in the third chapter The integrated scheme with the use of the filtrate from the pretreatment of the CS and the growth conditions of *Pleurotus cystidiosus* is studied in the fourth chapter The last chapter of this section provides the conditions of the key parameters in microfluidic systems residence times flow rates concentrations applied for a sequential process from liquid liquid extraction of LVV h7

Enzymes Beyond Traditional Applications in Dairy Science and Technology Y.S. Rajput, Rajan Sharma, 2023-01-26 A volume in the series on Foundations and Frontiers of Enzymology Enzymes Beyond Traditional Applications in Dairy Science and Technology presents the applications of enzymes in dairy science and technology Broken into four sections this book provides a brief account of traditional applications of indigenous milk enzymes the actions of exogenous enzymes on milk proteins for generating bioactive peptides and lactose for value addition and

methods and approaches for ensuring milk quality or cleaning milk plants This book is an excellent resource for postgraduate students academics food scientists and dairy professionals engaged in milk processing Provides coverage on in vitro generation and in silico prediction of bioactive peptides by action of proteolytic enzymes on major milk proteins and peptides generated during fermentation and cheese manufacturing and their downstream processing Presents the enzymatic conversion of lactose into galactooligosaccharides or tagatose or producing low lactose milk Discusses indigenous enzymes in normal and mastitis milk Covers regulatory policies on enzyme use in food science Understanding Enzymes Allan Svendsen,2016-04-27 Understanding Enzymes Function Design Engineering and Analysis focuses on the understanding of enzyme function and optimization gained in the past decade past enzyme function analysis enzyme engineering and growing insights from the simulation work and nanotechnology measurement of enzymes in action in vitro or in silico The book also prese **Enzymatic Processes for Food Valorization** Monica L. Chavez Gonzalez,Jose Juan Buenrostro Figueroa,Cristobal Noe Aguilar,Deepak K. Verma,2024-06-28 Enzymatic Processes for Food Valorization describes the most recent research in the field of catalysis for food valorization revealing the impact of the implementation of enzymatic catalysis in the different stages that make up the production processes Sections review advances in food processing using enzymes explore the use of enzymes on by products for the release of compounds of interest and show recent trends in biocatalysis and its application in the food industry Written by a team of international experts this is an invaluable guide for professionals in the area of enzyme technology applied in the food industry as well as technicians and scientists involved in the use of enzymes on food waste for the valorization and or recovery of compounds Protocols and Applications in Enzymology Seema Anil Belorkar,Sudisha Jogaiah,2021-11-19 Protocols and Applications in Enzymology provides instruction on the experimental procedures of enzyme isolation techniques innovative screening techniques and instrument enabled enzyme assays and their underlying principles among other protocols The book serves as a one stop solution for those working with different enzyme protocols in the fields of biochemistry microbiology biotechnology and allied subjects Each chapter offers a full overview of protocol key resources materials required quantifiable and statistical analysis optimization and troubleshooting safety considerations and standards Applications are discussed across distribution and diversity of microbial enzymes enzyme screening enzymes in solid state fermentations enzyme assays enzyme kinetics and biotechnological uses Provides step by step instruction on enzyme protocols and applications with actionable discussions of needed resources materials quantification and statistical analysis optimization and troubleshooting safety considerations and standards Presents easy to read reproducible protocols for researchers and students across academia and industry Includes color diagrams that illustrate key concepts *Effect of High-Pressure Technologies on Enzymes* Bruno Ricardo de Castro Leite Júnior,Alline Artigiani Lima Tribst,2023-02-06 Effect of High Pressure Technologies on Enzyme Science and Applications provides a deep practical discussion of high pressure processing HPP and high pressure homogenization HPH

technologies and biochemical approaches applied across research and industry with applications ranging from food to pharmaceuticals and commercial enzyme production Early chapters discuss foundational aspects of HPP and HPH approaches the science of enzyme modification and basic aspects of enzyme activity stability and structure as studied in biochemical processes Later chapters consider the effect of HPP and HPH technologies and their mechanisms of controlling enzyme modification to improve enzyme performance for chosen applications Special attention is paid to the application of HPP and HPH technologies and enzyme modifications in food processing microbial enzyme modification drug discovery and production of other commercial enzymes as well as the challenges of undesirable enzyme inactivation The final chapter discusses future directions of the field and technologies and expanded applications Offers a broad overview of HPP and HPH approaches and technologies applied in enzyme modification Introduces fundamental aspects of enzyme activity stability and structure as studied in biochemical processes and applications Discusses applications of HPP and HPH based enzyme modifications in food processing microbial enzyme modification drug discovery and production of other commercial enzymes Includes chapter contributions from international leaders in the field across research and industry

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