



Microbial alkaline serine proteases: Production, properties and applications

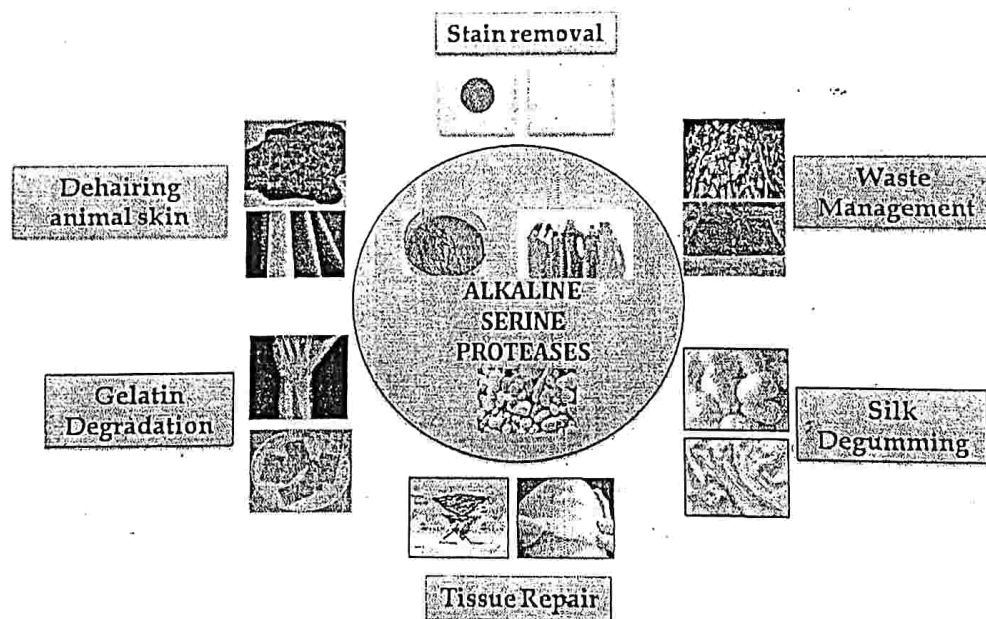
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Abstract

Proteolytic enzymes hold a pivotal position in numerous industrial processes where hydrolysis of protein molecules is required under precise conditions. The emerging trend of biotechnological applications in recent years has witnessed a renewed interest in alkaline serine proteases extending their utility in detergent, leather, textile, food and pharmaceutical industries. A variety of microorganisms have been reported to produce alkaline serine proteases on a large scale, however, extensive research to find an alkaline serine protease with desirable characteristics such as significant catalytic efficiency, expanded stability and broad substrate specificity is still ongoing. Although submerged fermentation dominates the commercial enzyme production, recent reports have emphasized on solid state fermentation technology which can reduce major cost associated with the enzyme production. In the present review, recent research on alkaline serine proteases along with their novel properties and production using solid state fermentation have been discussed.

Graphic abstract

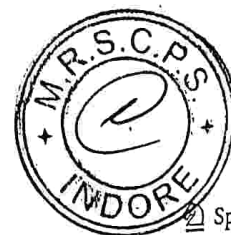


Keywords Alkaline serine protease · Solid state fermentation · Industrial applications · Biochemical properties

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Emerging Trend of Bio-plastics and Its Impact on Society

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This work was carried out in collaboration among all authors. Author SS designed the study, performed literature searches and wrote the first draft of the manuscript. Authors FM and SG performed literature searches and improved the first draft of the manuscript. Authors AN and SN also contributed in literature search and improved the manuscript. Author AK designed and supervised the study, gave instructions to all the co-authors, contributed in adding recent references and finalized the manuscript. All authors read and approved the final manuscript.

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Mini-review Article

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ABSTRACT

Bio-plastics are either bio-based polymers or capable of degradation into simple compounds. The rising development in the production and use of bio-plastics has globally revolutionized the dependency on traditional plastics. The conventional plastics prepared from petroleum, coal and natural gas have been extensively used by humans since antiquity as a prime component of almost all the materials used in day to day life. Since, these plastics are non-biodegradable; they cause serious impact on the environment. Recent years have witnessed the introduction of a wide variety of bio-plastics derived from natural polymers such as starch, cellulose, chitin etc. These bio-plastics are now being utilised in packaging materials, electronics, medical devices; holding immense potential for utility in future. This mini-review confers about types of bio-plastics, their utility in different sectors and their future prospective.

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ORIGINAL ARTICLE



Production of polygalacturonase using *Carica papaya* peel biowaste and its application for pomegranate juice clarification

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Abstract

The present study focuses on utilization of papaya peel for polygalacturonase production in solid-state fermentation (SSF). Papaya peel was screened as optimum solid substrate and valorized under SSF for polygalacturonase production by *Aspergillus niger* AN07 and the effect of different fermentation parameters viz. fermentation time, particle size, moisture content and agitation speed on the enzyme production was investigated. Two fermentation variables viz. moisture content and fermentation time have been identified to significantly affect polygalacturonase production as predicted using Plackett–Burman Design (PBD). It was further optimized by Response Surface Methodology (RSM) using Rotatory Central Composite Design (RCCD). An overall 5.4-fold increase (264.20 U/g dried substrate) in enzyme production was achieved after optimization at fermentation time 144 h and moisture content 90%. The results of RSM showed that the model was in good agreement with experimental results with $R^2 = 99.6\%$ ($P < 0.05$). *A. niger* AN07, *A. tubingensis* MP30, *A. fumigatus* M1 and *A. sydowii* indicated a high growth rate of 0.55, 0.52, 0.39 and 0.25 mm/h, respectively on the optimized solid substrate in SSF. Native PAGE and Zymogram study showed predominant presence of polygalacturonase in the purified preparation. The purified polygalacturonase enzyme significantly increased pomegranate juice clarification by 3.6-fold and prevented haze formation during storage conditions.

Keywords Polygalacturonase · Biowaste · Papaya peel · Solid state fermentation · Response surface methodology

Introduction

Solid State Fermentation (SSF) has several economic advantages that have demanded the researchers' interest in recent years for the production of industrially important enzymes. The SSF process has been reported to be the most suitable because of its high productivity, easy enzyme recovery and cost effectiveness for the production of fungal enzymes

(Vinięra-González et al. 2003; Pandey et al. 2000). The agro-industrial residues are not only economical solid substrates but also suitable for extracellular enzyme production due to low cost of harvesting and thus are considered best suited for production of enzymes in SSF (Mahmoodi et al. 2019). Pectin is the integral part of middle lamella of plant cell wall (Caffall and Mohnen 2009). It is composed of D-galacturonic acids joined together by α -1, 4 glycosidic linkages, in which a few hydroxyl groups are methylated. Pectin methylesterase, polygalacturonase and pectin lyase completely degrade pectin, releasing galacturonic acid units (Combo et al. 2012). Polygalacturonase is a pectinolytic enzyme that hydrolyses pectic substances randomly and produces oligosaccharides. This enzyme has been reported to be produced by higher plants and microorganisms including bacteria and fungi (Uzuner and Cekmecelioglu 2015; Patidar et al. 2018; Aggarwal et al. 2020). Polygalacturonase is mainly used in beverage industries for extraction and clarification of fruit and vegetable juices. Additionally, it has important role in tea and coffee industry, textile industry, animal feed industry, treatment of waste water, protoplast

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शब्द-ब्रह्म

भारतीय भाषाओं की अंतर्राष्ट्रीय मासिक शोध पत्रिका

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पीअर रीव्यूड रेफीड रिसर्च जर्नल

हिंदी उपन्यासों में रचनात्मक कार्यक्रम: एक विश्लेषण

श्रीमती अर्चना त्रिवेदी (शोधार्थी)

भाषा अध्ययन शाला

देवी अहिल्या विश्वविद्यालय

डॉ पुष्पेंद्र दुबे (निर्देशक)

महाराजा रणजीत सिंह कॉलेज ऑफ़ प्रोफेशनल साइंसेस

इंदौर, मध्यप्रदेश, भारत

शोध संक्षेप

साहित्य में समाज का प्रतिबिम्ब उपस्थित होता है। युग चेतना से संपृक्त साहित्य समाज की प्रवृत्तियों को उजागर करता है। साहित्यकार के लिए समाज की घटनाएं कच्चे माल के रूप में होती हैं, जिन्हें वह अपनी कल्पना शक्ति से कथानक में चित्रित करता है। हिंदी उपन्यासकारों ने देश और समाज को प्रभावित करने वाली स्थितियों को अपने उपन्यासों में अभिव्यक्त किया है। प्रस्तुत शोध पत्र में हिंदी उपन्यासों में वर्णित रचनात्मक कार्यक्रम का विश्लेषण किया गया है।

प्रस्तावना

साहित्य और समाज का अंतर्संबंध बहुत स्पष्ट है। साहित्य में समाज की चित्तवृत्तियां प्रतिबिम्बित होती हैं। साहित्यकार की कालप्रवाह को देखने की दृष्टि अलग होती है। वह आमजनजीवन में पलामिला होने के बाद भी उससे असंपृक्त रहकर परिस्थितियों का आकलन करता है और अपनी साहित्य में उन्हें अभिव्यक्त करता है। हिन्दी उपन्यास साहित्य अपनी विकास यात्रा में जिन मोड़ों से होकर गुजरा है, उसमें भारतीय स्वाधीनता संग्राम का एक लंबा कालखंड है। हिन्दी उपन्यासों में सन् 1857 के प्रथम स्वाधीनता संग्राम से लेकर सन् 1947 में भारत के आजाद होने तक अनेक विचारधाराओं के उत्थान-पतन को अभिव्यक्ति मिली है। आजादी

प्रतिध्वनि सुनायी देती है। भारतेंदु काल के विभिन्न उपन्यासकारों ने आधारपीठिका तैयार की, परंतु उनके उपन्यास सामाजिक सरोकारों से बहुत दूर थे। मुंशी प्रेमचंद ने उपन्यास को सोद्देश्यता प्रदान की। उसे यथार्थ के धरातल पर उतारकर समाज के साथ उसका संबंध स्थापित किया। जब प्रेमचंद ने लिखना प्रारंभ किया, तब भारतीय राजनीति में महात्मा गांधी का प्रवेश हुआ। भारत की आध्यात्मिक पृष्ठभूमि होने से समाज ने गांधीजी के सत्य और अहिंसा के विचार को स्वीकार किया। मुंशी प्रेमचंद ने इस सूत्र को पकड़कर अपने उपन्यासों के कथानक में गांधी विचार को जगह दी। महात्मा गांधी ने अंग्रेजों से देश को आजाद कराने के लिए सत्याग्रह का शस्त्र दिया और देश के पुनर्निर्माण



संस्कृत-६

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राष्ट्रीय मातृशोध पत्रिका

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इलेक्ट्रॉनिक जर्नल

उपन्यास के प्रारम्भ में प्रवीन भी हिंसा को आजाद करने का पक्ष में थे। जाकर वह अपना रास्ता बदल देता। उनकी जानकारी इस संवाद से होती कहता है, "प्रवीन भइया तो मुझसे इसी पार्टी में रहे। अब वह अहिंसा हैं, हमारे पुत्रों के साथ तो वह नहीं हैं, लेकिन यह सभाड़ा के अहिंसावादी बार-बार सामाजिक करने क्यों पहुँच जाते हैं। बराबर है....हम अपने खून से जिरा करते हैं, उसी से ही सफेद कर जाते हैं। क्रान्तिकारी दल रैलागाड़ी से खजाना लूट लेते हैं। इस पर मोहल्ले वालों पर जुर्माना लगाने के इस फैसले का विरोध करती है। अन्ततः अंग्रेज सरकार फरमान वापस लेना पड़ता है। वह घर पर बसाता है, "देखा, अहिंसा कैसे मसलों को सुलझाया जा सके। धरती को आजाद करने का अहिंसा का रास्ता यह है। भारत माता इसी तरह आजादी उपन्यास में प्रवीन महात्मा गांधी की प्रतिनिधि पात्र हैं। वह अहिंसा की व्याख्या भी करता है। अगले दिन थाने वाले प्रवीन थाने जाने लाए, प्रवीन भी हो लिए। मिजो भी प्रवीन ने मिजो को हिंसा बंद और शांति और आसानी से

मिर्जा साहब बोले - तो असहयोग शुरू करो! तुम तो जाने से इनकार करो!

न असहयोग का मतलब इनकार नहीं है..हर को इनकार करना असहयोग का मकसद नहीं है..सहयोग करो, पर जहाँ सत्य न हो, उसे छोड़ कर गत करो....यह असहयोग होता है। प्रवीन

मिर्जा की महिला पात्र शांता के चरित्र को जो ऊँचाई प्रदान की है। अनेक अवसरों पर उसी से लोहा लेती है। उसका स्पष्ट मत है "अब इस देश को कोई भी आजाद करे! अब यह देश गुलाम नहीं रह सकता!"7 मिर्जा भी से आशय है हिंसा से अथवा के मार्ग से देश को आजाद तो होना ही है। एक अंग्रेज प्रवीन की मूर्खों को हाथ है, तब शांता शेरनी की तरह आगे आकर है, "ऐई फ़िरंगी बाबू! मूर्खों को हाथ मत देना तुम्हारा खून पी जाऊँगी...ये मेरे मरद हैं। कहते हुए उसने अंग्रेज इन्स्पेक्टर को डाँट दिया।"8

महात्मा गांधी के सत्याग्रह ने महिलाओं में एक का संचार किया। भारतीय समाज में महिलाओं को घर की चहारदीवारी के भीतर रखा था। महात्मा गांधी ने उन्हें आजादी के लिए बाहर निकलने के लिए प्रेरित किया। महिलाओं ने भी सत्याग्रह में बड़े-छोटे किया। उपन्यास में जब अंग्रेज प्रवीन को आने के लिए कहता है, तब शांता आ जाती है और कहती है, "कभी नहीं। यह हमारा त्योहार का दिन है। हम त्योहार मनाएंगे...। शांता का यह रूप भारतीयों में चर्चा होने लगती है, "शेरनी



ADSORPTION OF TOXIC IONS BY COLOCASIA ESCULANTA PEELS FROM ULTRAMARINE BLUE EFFLUENT

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Abstract: The ability of arbi peels (*colocasia esculenta*) as low-cost natural adsorbents were investigated for adsorptive removal of toxic ions from ultramarine blue industrial effluent. The removal percentage is comparatively higher with chemically treated adsorbents within samples collected from Ultramarine blue pvt. Limited. Spectrophotometric and ICP Spectroscopic (Inductively coupled plasma mass spectroscopy) techniques are used for estimation.

Keywords: Adsorptive, toxic, ICP, effluents, estimation.

Introduction

As a number of research projects are going on worldwide to establish appropriate, effective and economical use of different agricultural wastes and by products for the removal of toxic metal ions from industrial effluents of different origins including textile, pharmaceutical, leather, battery units situated in different areas of a particular city^{1,2,3}.

Present study is an attempt to resolve the major global issues as toxic metal ions are present in higher concentrations in industrial effluents as discharge of ultramarine blue pvt. Limited. Ultramarine blue industrial effluents collected from sampling site s_1 to s_6 is used against adsorption of adsorbents prepared from arbi peel. This work also connects purification of effluents collected from ultramarine blue unit. If it is allowed to mix into water stream without treatment then it may pose threat to the aquatic life. Actually, such pollutants are hazardous because of their non-biodegradable nature.

The adsorption efficiency of adsorbent prepared from arbi peel against toxic metal ions including Cd, Cr, Zn, Cu and Pd is determined in terms of percentage adsorption and using treated and untreated sample of arbi peel⁴.





Review article

Sources and biological activity of Coumarins: An Appraisal

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Keywords

Natural coumarin Source
biological activities

Abstract

Coumarin was first isolated as a natural product in 1820 and named as derived from the French word for the seeds of Tonka bean, *coumarou*, *Dipteryx odorata* (*Coumarouna odorata*) (*Leguminosae/ Fabaceae*). The structure of heterocyclic compound is found in most of the drugs that is the reason why heterocycles are of vital interest in the pharmaceutical and agrochemical science. In the metabolism of most of the living cells various heterocyclic compounds plays important role. In addition, a wide variety of pharmacological, biological and physiological activities are also exhibited by O-based heterocyclic aromatic coumarin compounds. There are following pharmacological activities for example; anti-cancerous, anti-coagulant, anti-oxidant, anti-HIV, anti-inflammatory and anti-bacterial which are exhibited by coumarin. Various sources of natural coumarins and their biological activities are compiled in the present review article.

Introduction

Heterocyclic compounds have an important part in the pharmaceutical industry for the search of effective bioactive agents. More than 90% of pharmaceutical drugs have a heterocyclic ring, e.g. penicillin, quinoline, which contains heterocyclic structures are used as analgesics, antibiotics and anti-tumor

drugs. Many of the heterocyclic compounds were isolated from natural resources and various synthetic methods were also developed for their synthesis. Major sources of complex heterocyclic compounds are the microorganisms which are used as antibiotics in various infectious diseases. The coumarins are classified under

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दिनांक: 21.10.2020

प्रमाण-पत्र

यह प्रमाणित किया जाता है कि श्रीमती परमजीत के. मोंगा एस.एन.पी.जी. शासकीय स्नातकोत्तर महाविद्यालय, खंडवा, (एम.पी.), भारत, द्वारा वैज्ञानिक तथा तकनीकी शब्दावली को प्रेषित लेख 'क्यूमेरिन व्युत्पन्नों के संश्लेषण की पीचमॉन अभिक्रिया में प्रयुक्त अम्लीय उत्प्रेरकों की दक्षता की तुलना' विज्ञान गरिमा सिंधु (रसायन) अंक में प्रकाशन हेतु चयनित किया गया है।

21/10/2020

(श्री. शिव कुमार चौधरी)
सहायक निदेशक



क्यूमेरिन व्युत्पन्नों के संश्लेषण की पीचमॉन अभिक्रिया में प्रयुक्त अम्लीय उत्प्रेरकों की दक्षता की तुलना

मोंगा परमजीत के.¹, भसीन शीतल², दुवे आरती³, नागर हरिओम¹ □□□ शर्मा दीपक^{4*}

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2. बायोसाइंसेज विभाग, महाराजा रणजीत सिंह महाविद्यालय ऑफ प्रोफेशनल साइंसेज, इंदौर, (एम.पी.), भारत

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शोध सार

पीचमॉन अभिक्रिया को मुख्य रूप से प्रतिस्थापित क्यूमेरिन के संश्लेषण के लिए प्रयोग किया जाता है जो उत्कृष्ट उत्पाद प्रदान करते हैं। अम्लीय उत्प्रेरक की उपस्थिति में प्रतिस्थापित फिनॉलो की अभिक्रिया बीटा-कीटो एस्टर से करवाई जाती है जिससे क्यूमेरिन प्राप्त होते हैं।

इस संश्लेषित अभिक्रिया द्वारा विभिन्न औषधीय व जैविक उपयोगी क्यूमेरिन व्युत्पन्न प्राप्त होते हैं। हमारे शोध कार्य में हमने विभिन्न अम्लीय उत्प्रेरकों के साथ विलायक मुक्त स्थिति में क्यूमेरिन व्युत्पन्नों के संश्लेषण के लिये सूक्ष्म तरंग (माइक्रोवेव) विकिरण के साथ पीचमॉन अभिक्रिया का उपयोग किया। सूक्ष्म तरंग विकिरण के प्रयोग से विलायकमुक्त परिस्थितियों का कार्यान्वयन एक स्वच्छ संश्लेषित अभिक्रिया और बेहतर उत्पाद प्रदान करता है। संश्लेषित यौगिकों विभिन्न □□□□□□□□□□□□ तकनीकों द्वारा व्यवस्थित रूप से चित्रित किया गया है।

शोध कुंजी: पीचमॉन अभिक्रिया, घरेलू सूक्ष्म तरंग ओवन (माइक्रोवेव ओवन), अम्लीय उत्प्रेरक (ऑक्सालिक अम्ल, एम्बरलिस्ट-15 ड्राय, मॉन्टमोरीलॉनाइट के-10, तथा सिलिका वॉल)।

परिचय

विषमचक्रीय यौगिक कार्बनिक यौगिकों के सबसे □□□□ और व्यापक स्तर का वर्ग है। विषमचक्रीय यौगिक में कार्बन व हाइड्रोजन के अतिरिक्त एक या एक से अधिक अन्य तत्व पाये जाते हैं। जिन्हें विषम परमाणु कहते हैं। सामान्यतः नाइट्रोजन, ऑक्सीजन और सल्फर आदि विषम परमाणु के रूप में पाये जाते हैं। विभिन्न प्राकृतिक और संश्लेषित कार्बनिक यौगिकों में विषमचक्रीय वलय पाई जाती है।

विषमचक्रीय यौगिकों को कार्बनिक यौगिकों की मुख्य एवं महत्वपूर्ण शाखा माना जाता है। डी.एन.ए., आर.एन.ए., क्लोरोफिल, मोनोक्लोविन, विभिन्न एन्जाइमों जैसे थियामीन (विटामिन बी1), राइबोफ्लेविन (विटामिन बी2), निकोटिनामाइड (विटामिन बी3), पाइरिडोक्सोल (विटामिन बी6) और एस्कार्बिक अम्ल (विटामिन सी) आदि जैव अणुओं में विषमचक्रीय वलय प्रमुख रूप से पाई जाती है।

क्यूमेरिन भी एक विषमचक्रीय यौगिक है जो कि बेन्जोपाइरॉन परिवार का सदस्य है जिसमें बेन्जीन वलय पाइरॉन वलय से जुड़ी रहती है। बेन्जोपाइरॉन को दो भागों में विभक्त किया जाता है। बेन्जो-पाइरॉन तथा बेन्जो-गामा-पाइरॉन। इनमें से क्यूमेरिन बेन्जो-अल्फा-पाइरॉन के अंतर्गत आता है।

तालिका-1 क्यूमेरिन का वर्गीकरण¹



One-pot synthesis of coumarin derivatives via microwave assisted Pechmann reaction and biological activity of substituted coumarin derivatives

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Pechmann reaction is mainly used for the synthesis of substituted coumarins as it can be executed with straight forward primary resources and gives coumarin derivatives with excellent yields. In the present work coumarin derivatives have been synthesized by condensation of β -ketoesters and substituted phenols under microwave irradiation in solvent free condition in which oxalic acid is used as catalyst. Oxalic acid is found to be a potential environment friendly catalyst for synthesis of coumarins. The new method of synthesis described here offers a number of advantages of being convenient, safe, gentle, shorter reaction time, high yield, and cleanness as compared to the conventional methods. The synthesized compounds have been systematically characterized by IR and MS analyses. All products are examined for antimicrobial activity against the Gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and Gram negative (*Escherichia coli* and *Salmonella typhi*) bacteria and antifungal activity against two fungal species (*Aspergillus sp.* and *Fusarium graminearum*). All the compounds inhibited the growth of bacteria as well as fungi.

Keywords: Antimicrobial, Antifungal, Coumarins, One-pot Microwave irradiation, Oxalic acid, Pechmann condensation.

Coumarins are found under class benzopyrones of heterocyclic compounds and most of natural products contain this heterocyclic nucleus. Coumarin is a compound with comprehensive range of biological, pharmacological and various physiological activities. Coumarins are used as anticoagulant¹⁻³, antibacterial^{4,5}, antioxidative⁶, antiviral^{7,8}, antitumor⁹⁻¹², bacteriocidal¹³, fungicidal¹⁴, anti-inflammatory and anti-HIV agents^{15(a,b),16}. For the preparation of coumarins various methods for example von Pechmann condensation¹⁷, Knoevenagel condensation¹⁸, Wittig reaction¹⁹, Perkin reaction²⁰, Reformatsky reaction^{21(a-d)}, and Flash vacuum pyrolysis^{22(a,b)} are used. Among all these methods Pechmann reaction seems to be quite facile and efficient method which requires acidic catalysts. In various reported methods the catalysts used have many disadvantage such as moisture sensitive, too toxic to the atmosphere, rigorous experimental process and expensive. In order to synthesize coumarins through Pechmann reaction a relevant and moderate catalyst is desirable. Moreover the catalyst should be recyclable which can be consequently used in the further reactions to make the process environment friendly. Using simple filtration method

water soluble catalyst is separated from insoluble products. In our work we used oxalic acid (as catalyst) for the synthesis of coumarins through Pechmann reaction. Biological evaluation of substituted coumarin derivatives was also done by performing microbiological bioassay. The biological activity was determined against bacteria and fungi. In this work, our purpose of research is to propose innovative and suitable ways of synthesizing coumarin derivatives and evaluation of their biological activities.

Experimental Section

Materials

All chemicals used were of analytical grade. For biological activity cultures were used from MTCC (Microbial Type Culture Collection, Chandigarh) and media used are of Hi-media and Merck and instruments are of Remi. *Streptomycin* and *Amphotericin B* were used as standard drugs. The chromatoplates were prepared by using silica gel G. IR spectroscopic analysis was done by using Shimadzu Fourier Transform Infra Red Spectrophotometer (KBr in cm^{-1}) (UGC-DAE



Tapping Into Actinobacterial Genomes for Natural Product Discovery

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The presence of secondary metabolite biosynthetic gene clusters (BGCs) makes actinobacteria well-known producers of diverse metabolites. These ubiquitous microbes are extensively exploited for their ability to synthesize diverse secondary metabolites. The extent of their ability to synthesize various molecules is yet to be evaluated. Current advancements in genome sequencing, metabolomics, and bioinformatics have provided a plethora of information about the mechanism of synthesis of these bioactive molecules. Accessing the biosynthetic gene cluster responsible for the production of metabolites has always been a challenging assignment. The genomic approach developments have opened a new gateway for examining and manipulating novel antibiotic gene clusters. These advancements have now developed a better understanding of actinobacterial physiology and their genetic regulation for the prolific production of natural products. These new approaches provide a unique opportunity to discover novel bioactive compounds that might replenish antibiotics' exhausted stock and counter the microbes' resistance crisis.

Keywords: actinobacteria, genomics, antibiotics, secondary metabolites, biosynthetic gene cluster

INTRODUCTION

Actinobacteria are an omnipresent group of bacteria that play an essential part in recycling complicated organic matter in the soil. They are of great interest for researchers as they are versatile producers of diverse metabolites with several biotechnological applications. Genome mining tools could help the researchers to determine the BGCs of secondary metabolites compounds like herboxidiene, paulomycin, sceliphrolactam, bagremycin, and humidimycin produced from *Streptomyces* (Lee et al., 2020). Actinobacteria synthesize several secondary metabolites with various biological activities (Passari et al., 2017). Several phenolic compounds (catechin, kaempferol,

Production and application of glucose isomerase from *Streptomyces enissocaesilis* and amylase from *Streptomyces* sp. for the synthesis of high fructose corn syrup

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Abstract

This study reports *Streptomyces* sp. strain T.S.A.KP identified as *Streptomyces enissocaesilis* isolated from soil inhabiting actinobacteria of Madhya Pradesh (India) as a new actinobacterial strain for production of glucose isomerase (GI) and *Streptomyces* sp. strain TSA. Dm1 closely related to *Streptomyces sampsonii* for the production of amylase. These strains were selected from an array of 120 actinobacterial isolates, which on screening originally yielded 38% GI producers and 36% amylase producers. *S. enissocaesilis* yielded maximum GI at pH 7 and 70 °C in 120 h. Highest amylase production from *Streptomyces* sp. strain TSA. Dm1 was observed at pH 7 and 37 °C in 96 h. Michaelis–Menten constant (K_m) for GI and amylase was 1.54 M and 0.36 M, respectively. V_{max} for GI was 11.76 U/ml and amylase 33 U/ml. These cultures were employed for HFCS production. Saccharification of corn starch was achieved up to 90.9% by *Streptomyces* sp. strain TSA. Dm1, and the glucose was isomerized to 40.8% by *S. enissocaesilis*. Presence of glucose and fructose in HFCS was also confirmed by high-performance liquid chromatography.

Keywords Actinobacteria · *Streptomyces* · Amylase · Glucose isomerase · High fructose corn syrup

1 Introduction

High fructose corn syrups (HFCS) in the past half century have gained remarkable attention as a sweetener for food and beverage industry. This liquid sweetener was developed in the 1960s as a partial replacement to sucrose which suffered production shortages and price hikes after Cuban revolution [1]. HFCS is an equilibrium mixture of glucose and fructose which has sweetening ability comparable with sucrose [2]. Fructose in HFCS is 1.3 times sweeter than sucrose and 1.7 times sweeter than glucose. Thus, HFCS possesses a higher sweetening capacity. This sweetener possesses a high commercial value, and its annual production is estimated to be 10 million tons [1].

Fructose is twice as sweet as sucrose, and glucose imparts 70–75% sweetening as that of sucrose [3]. HFCS

is chiefly produced from non-sweet sources like starch or cellulose which makes it cheaper than sucrose [4]. Apart from this, HFCS is stable and does not pose the problem of crystallization. Its commercial manufacturing began from 1970s opening a new frontier in the sweetening market.

The industrial production of HFCS requires two important stages. In initial step, amylase is employed for saccharification of non-sweet starch to monomeric glucose units followed by its isomerization into fructose using glucose isomerase [5]. Usually two variants, HFCS-42 (42% fructose) and HFCS-55 (55% fructose) are available commercially [6]. The concentration of fructose in HFCS can be enriched to 90%, but industrially HFCS-55 is chiefly used as sweetener in cold drinks, ice cream and yogurts. HFCS-42 finds its usage in confectionary and beverage industries [7].

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Review article

Sources and biological activity of Coumarins: An Appraisal

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Keywords

Natural coumarin Source
biological activities

Abstract

Coumarin was first isolated as a natural product in 1820 and named as derived from the French word for the seeds of Tonka bean, *coumarou*, *Dipteryx odorata* (*Coumarouna odorata*) (*Leguminosae/ Fabaceae*). The structure of heterocyclic compound is found in most of the drugs that is the reason why heterocycles are of vital interest in the pharmaceutical and agrochemical science. In the metabolism of most of the living cells various heterocyclic compounds plays important role. In addition, a wide variety of pharmacological, biological and physiological activities are also exhibited by O-based heterocyclic aromatic coumarin compounds. There are following pharmacological activities for example; anti-cancerous, anti-coagulant, anti-oxidant, anti-HIV, anti-inflammatory and anti-bacterial which are exhibited by coumarin. Various sources of natural coumarins and their biological activities are compiled in the present review article.

Introduction

Heterocyclic compounds have an important part in the pharmaceutical industry for the search of effective bioactive agents. More than 90% of pharmaceutical drugs have a heterocyclic ring, e.g. penicillin, quinoline, which contains heterocyclic structures are used as analgesics, antibiotics and anti-tumor

drugs. Many of the heterocyclic compounds were isolated from natural resources and various synthetic methods were also developed for their synthesis. Major sources of complex heterocyclic compounds are the microorganisms which are used as antibiotics in various infectious diseases. The coumarins are classify under

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प्रमाण-पत्र

यह प्रमाणित किया जाता है कि श्री. तनिम अर्पित सिंह, महाराजा रंजीत सिंह कॉलेज ऑफ़ प्रोफेशनल साइंसेज, इंदौर, (एम.पी.) द्वारा वैज्ञानिक तथा तकनीकी शब्दावली को प्रेषित लेख ' एच.एफ.एस. के उत्पादन के लिए ग्लूकोज़ आइसोमरेज की जैव रासायनिक विशेषताओं पर निश्चलिकरण का प्रभाव ' विज्ञान गरिमा सिंधु (रसायन) अंक में प्रकाशन हेतु चयनित किया गया है।



10. हमार

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निश्चलिकरण का प्रभाव

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तनिम अर्पित सिंह, शीतल भसीन*

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सार

ग्लूकोज़ आइसोमेरेज (जी.आई.) खाद्य उद्योग का एक महत्वपूर्ण प्रक्रिण्व है, यह ग्लूकोज़ का फ्रुक्टोज़ में समावयवन कर देता है, इसलिए इसका प्रमुख अनुप्रयोग हाई फ्रुक्टोज़ सिरप (एच.एफ.एस.) के निर्माण में होता है। फ्रुक्टोज़, ग्लूकोज़ से अधिक मिठास प्रदान करता है। औद्योगिक स्तर पर खाद्य पदार्थों एवं दवाओं को मिठास प्रदान करने के लिए हाई फ्रुक्टोज़ सिरप का इस्तमाल किया जाता है। बड़े स्तर पर हाई फ्रुक्टोज़ सिरप बनाने के लिए अधिक मात्रा में समावयवन करने की आवश्यकता होती है जिसके लिए अत्यधिक मात्रा में जी.आई. उपयोग हो जाता है। जी.आई. के निश्चलन से हम कम प्रक्रिण्व से अधिक उत्पाद का निर्माण कर सकते हैं। जी.आई. का निश्चलन एच.एफ.एस. के निर्माण की प्रक्रिया को कम खर्चीला बना सकता है, क्योंकि निश्चलित जी.आई. को पुनः उपयोग में लाया जा सकता है। वर्तमान अध्ययन कार्य में जी.आई. को ऐगार में निश्चलित करने के उपरांत उस पर पड़ने वाले जैव रसायनिक प्रभावों को दर्शाया गया है। निश्चलित जी.आई. के परिवर्तित गुणों की तुलना मुक्त प्रक्रिण्व के साथ की गई है। निश्चलित जी.आई. ने 7 पी.एच. पर 5.24 यूनिट्स/मिलिलीटर की प्रतिक्रिया प्रदर्शित की जो की मुक्त प्रक्रिण्व (3.65 यूनिट्स/मिलिलीटर) की तुलना में 28% ज्यादा थी। निश्चलन से पहले जी.आई. की उच्च क्रियाशीलता सिर्फ उदासीन पी.एच. (7) पर सीमित थी, ऐगार ने प्रक्रिण्व को बेहतर स्थिरता प्रदान की जिसके कारण जी.आई. की क्रियाशीलता 7 पी.एच. के अलावा क्षारीय पी.एच. 8 एवं 9 पर भी बढ़ी हुई पाई गई। निश्चलित जी.आई. ने 80 एवं 90 डिग्री सेल्सियस के उच्च ताप में भी अच्छी क्रियाशीलता प्रदर्शित की। मुक्त जी.आई. ने 70 डिग्री सेल्सियस पर 4.25 यूनिट्स/मिलिलीटर की क्रियाशीलता प्रदर्शित की जो कि निश्चलन के पश्चात बढ़कर 5.04 यूनिट्स/मिलिलीटर हो गई। निश्चलित जी.आई. ने 90 डिग्री सेल्सियस पर मुक्त प्रक्रिण्व से 46.4% ज्यादा क्रियाशीलता दर्शायी। निश्चलित जी.आई. की पुनः प्रयोगिता की जांच में यह पाया गया कि तीन चक्रों तक जी.आई. की प्रतिक्रिया 60% तक बरकरार रही।

1. परिचय

ग्लूकोज़ आइसोमेरेज (जी.आई.) एक व्यवसायिक रूप से महत्वपूर्ण प्रक्रिण्व है क्योंकि यह ग्लूकोज़ को समावयवन कर फ्रुक्टोज़ में बदल देता है। ग्लूकोज़ एवं फ्रुक्टोज़ समावयव हैं परंतु फ्रुक्टोज़ में घुलने की क्षमता एवं मिठास ज्यादा होती है। ग्लूकोज़ की तुलना में फ्रुक्टोज़ के कम अणु वही मिठास पैदा कर सकते हैं। इस वजह से किसी भी पदार्थ में कमतर कैलोरी में ज्यादा मिठास प्रदान की जा सकती है। इस प्रक्रिण्व की यह क्षमता इसे एमाइलेज





सत्यमेव जयते

संख्या/N^o 3-14/2019- विज्ञान गरिमा सिंधु (रसायन) भारत सरकार

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मानव संसाधन विकास मंत्रालय

(उच्चतर शिक्षा विभाग)

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दिनांक: 21.10.2020

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प्रमाण-पत्र

यह प्रमाणित किया जाता है कि श्रीमती परमजीत के. मोंगा एस.एन.पी.जी. शासकीय स्नातकोत्तर महाविद्यालय, खंडवा, (एम.बी.), भारत, द्वारा वैज्ञानिक तथा तकनीकी शब्दावली को प्रेषित लेख 'क्यूमेरिन व्युत्पन्नों के संश्लेषण की पीचमॉन अभिक्रिया में प्रयुक्त अम्लीय उत्प्रेरकों की दक्षता की तुलना' विज्ञान गरिमा सिंधु (रसायन) अंक में प्रकाशन हेतु चयनित किया गया है।



21/10/2020

(श्री. शिव कुमार चौधरी)

सहायक निदेशक

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1. रसायन विज्ञान विभाग, सुरेश ज्ञानविहार विश्वविद्यालय, जयपुर, राजस्थान, भारत

1. रसायन विज्ञान विभाग, सुरेश ज्ञानविहार विश्वविद्यालय, जयपुर, राजस्थान, भारत

भारत

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इस संश्लेषित अभिक्रिया द्वारा विभिन्न औषधीय व जैविक उपयोगी क्यूमेरिन व्युत्पन्न प्राप्त होते हैं। हमारे शोध कार्य में हमने विभिन्न अम्लीय उत्प्रेरकों के साथ विलायक मुक्त स्थिति में क्यूमेरिन व्युत्पन्नों के संश्लेषण के लिये सूक्ष्म तरंग (माइक्रोवेव) विकिरण के साथ पीचमॉन अभिक्रिया का उपयोग किया। सूक्ष्म तरंग विकिरण के प्रयोग से विलायकमुक्त परिस्थितियों का कार्यान्वयन एक स्वच्छ संश्लेषित अभिक्रिया और बेहतर उत्पाद प्रदान करता है। संश्लेषित यौगिकों विभिन्न तकनीकों द्वारा व्यवस्थित रूप से चित्रित किया गया है।

शोध कुंजी: पीचमॉन अभिक्रिया, घरेलू सूक्ष्म तरंग ओवन (माइक्रोवेव ओवन), अम्लीय उत्प्रेरक (ऑक्सालिक अम्ल, एम्बरलिस्ट-15 ड्राय, मॉन्टमोरीलॉनाइट के-10, तथा सिलिका बॉल)।

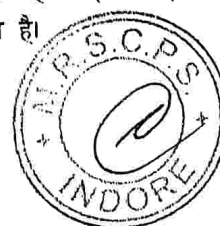
परिचय

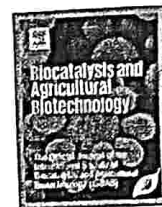
विषमचक्रीय यौगिक कार्बनिक यौगिकों के सबसे □□□□ और व्यापक स्तर का वर्ग है। विषमचक्रीय यौगिक में कार्बन व हाइड्रोजन के अतिरिक्त एक या एक से अधिक अन्य तत्व पाये जाते हैं। जिन्हें विषम परमाणु कहते हैं। सामान्यतः नाइट्रोजन, ऑक्सीजन और सल्फर आदि विषम परमाणु के रूप में पाये जाते हैं। विभिन्न प्राकृतिक और संश्लेषित कार्बनिक यौगिकों में विषमचक्रीय वलय पाई जाती हैं।

विषमचक्रीय यौगिकों को कार्बनिक यौगिकों की मुख्य एवं महत्वपूर्ण शाखा माना जाता है। डी.एन.ए., आर.एन.ए., क्लोरोफिल, हेमोग्लोबिन, विभिन्न एन्जाइमों जैसे थियामीन (विटामिन बी1), राइबोफ्लेविन (विटामिन बी2), निकोटिनामाइड (विटामिन बी3), पाइरिडोक्सोल (विटामिन बी6) और एस्कॉर्बिक अम्ल (विटामिन सी) आदि जैव अणुओं में विषमचक्रीय वलय प्रमुख रूप से पाई जाती है।

क्यूमेरीन भी एक विषमचक्रीय यौगिक है जो कि बेन्जोपाइरॉन परिवार का सदस्य है जिसमें बेन्जीन वलय पाइरॉन वलय से जुड़ी रहती है बेन्जोपाइरॉन को दो भागों में विभक्त किया जाता है। बेन्जो-अल्फा-पाइरॉन तथा बेन्जो-गामा-पाइरॉन। उनमें से क्यूमेरीन बेन्जो-अल्फा-पाइरॉन के अंतर्गत आता है।

तालिका-1. क्यूमेरिन का वर्गीकरण¹





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Optimization of various encapsulation systems for efficient immobilization of actinobacterial glucose isomerase

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Immobilization
Chitosan
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ABSTRACT

Glucose isomerase (GI) converts glucose into fructose by a reversible reaction. This reaction is industrially valuable for the production of high fructose corn syrup (HFCS) which is used as a sweetener by food and beverage industries. GI being an expensive enzyme necessitates its usage in immobilized form for increasing its reusability and economic viability. Global HFCS production accounts to 10 million tons which is highest among products yielded by immobilized process. Current study evaluates different encapsulation systems for immobilization of GI produced by *Streptomyces* sp. T.S.A.KP which was found to be *Streptomyces enissocaesilis* (Accession number MN911386). This is the first report of extracellular GI production by a strain of *Streptomyces enissocaesilis*. GI was immobilized using chitosan, alginate and agar to enhance its stability and conversion efficiency. The concentration of polymeric gel with cross linking agent was optimized to get ideal pore size for maximum GI activity. Immobilization on chitosan significantly increased ($P < 0.05$) the GI activity by 47.18%. Agar increased the GI activity by 19.7% and alginate exhibited 18.5% higher activity than soluble enzyme. Thermal stability was increased by all three processes but maximally enhanced by chitosan immobilization. Chitosan immobilized GI exhibited enhanced activity at acidic pH whereas agar immobilization enhanced GI activity in alkaline range. The chitosan-TPP immobilization proved better than other encapsulation systems. HFCS was produced using immobilized GI. High performance liquid chromatography (HPLC) analysis of HFCS revealed that it comprised of an equilibrium mixture of glucose and fructose.

1. Introduction

Glucose isomerase (E.C. 5.3.1.5) isomerizes glucose into fructose and xylose into xylulose. It is also referred as xylose isomerase as it has higher affinity for xylose but the conversion reaction of glucose into fructose carries greater commercial importance. Glucose isomerase (GI) is widely utilized in production of HFCS, a chief sweetener used in food and beverages. Higher solubility and sweetening capacity of fructose than glucose makes it an attractive sweetener at industrial level. HFCS is cheaper than glucose and also has lower calorific value. For decades, the conversion of glucose to fructose has been of high interest and great commercial value (Fatima and Javed, 2020). HFCS finds wide application in food (confectionary, baking and softdrinks) and pharmaceutical industries to impart sweet taste in the products. Annual global production of GI is around 10 million tons GI is an expensive enzyme, therefore, to make the isomerization process economically feasible its immobilization is necessary. The immobilization of enzyme can be carried out by

adsorption to insoluble carrier, entrapment within polymeric supports, cross linking and covalent binding with supports (Tumturk et al., 2008). Among these different methods of enzyme immobilization entrapment process causes least damage to the enzyme structure, therefore this method was opted for the current study. GI Immobilization has been reported by different methods using GAMM support (Yu et al., 2011), silica xerogel (Perminova et al., 2009), Eupergit C 250L (Katchalski-Katzir and Kraemer, 2000) and non porous glass surface (Chopda et al., 2014). Since GI is widely used in food industry, its immobilization carrier must be non-toxic and economical (Wang et al., 2009). In current investigation, chitosan, alginate and agar were used for immobilization of GI. These three carriers were chosen as they are easily available, economic, non-toxic and biodegradable.

Production of GI can be traced back to initial report by Marshall and Kooi in 1957 using *Pseudomonas hydrophila*. Since then *Actinoplanes* sp., *Streptomyces* sp., *Bifidobacterium* sp., *Bacillus* sp. and *Lactobacillus* sp. have been reported for GI production. Actinobacteria are well known

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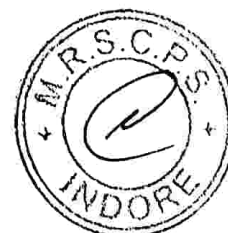
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One-pot synthesis of coumarin derivatives via microwave assisted Pechmann reaction and biological activity of substituted coumarin derivatives

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Pechmann reaction is mainly used for the synthesis of substituted coumarins as it can be executed with straight forward primary resources and gives coumarin derivatives with excellent yields. In the present work coumarin derivatives have been synthesized by condensation of β -ketoesters and substituted phenols under microwave irradiation in solvent free condition in which oxalic acid is used as catalyst. Oxalic acid is found to be a potential environment friendly catalyst for synthesis of coumarins. The new method of synthesis described here offers a number of advantages of being convenient, safe, gentle, shorter reaction time, high yield, and cleanness as compared to the conventional methods. The synthesized compounds have been systematically characterized by IR and MS analyses. All products are examined for antimicrobial activity against the Gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and Gram negative (*Escherichia coli* and *Salmonella typhi*) bacteria and antifungal activity against two fungal species (*Aspergillus sp.* and *Fusarium graminearum*). All the compounds inhibited the growth of bacteria as well as fungi.

Keywords: Antimicrobial, Antifungal, Coumarins, One-pot Microwave irradiation, Oxalic acid, Pechmann condensation.

Coumarins are found under class benzopyrones of heterocyclic compounds and most of natural products contain this heterocyclic nucleus. Coumarin is a compound with comprehensive range of biological, pharmacological and various physiological activities. Coumarins are used as anticoagulant¹⁻³, antibacterial^{4,5}, antioxidative⁶, antiviral^{7,8}, antitumor⁹⁻¹², bacteriocidal¹³, fungicidal¹⁴, anti-inflammatory and anti-HIV agents^{15(a,b),16}. For the preparation of coumarins various methods for example von Pechmann condensation¹⁷, Knoevenagel condensation¹⁸, Wittig reaction¹⁹, Perkin reaction²⁰, Reformatsky reaction^{21(a-d)}, and Flash vacuum pyrolysis^{22(a,b)} are used. Among all these methods Pechmann reaction seems to be quite facile and efficient method which requires acidic catalysts. In various reported methods the catalysts used have many disadvantage such as moisture sensitive, too toxic to the atmosphere, rigorous experimental process and expensive. In order to synthesize coumarins through Pechmann reaction a relevant and moderate catalyst is desirable. Moreover the catalyst should be recyclable which can be consequently used in the further reactions to make the process environment friendly. Using simple filtration method

water soluble catalyst is separated from insoluble products. In our work we used oxalic acid (as catalyst) for the synthesis of coumarins through Pechmann reaction. Biological evaluation of substituted coumarin derivatives was also done by performing microbiological bioassay. The biological activity was determined against bacteria and fungi. In this work, our purpose of research is to propose innovative and suitable ways of synthesizing coumarin derivatives and evaluation of their biological activities.

Experimental Section

Materials

All chemicals used were of analytical grade. For biological activity cultures were used from MTCC (Microbial Type Culture Collection, Chandigarh) and media used are of Hi-media and Merck and instruments are of Remi. *C. Streptomycin* and *Amphotericin B* were used as standard drugs. The chromatoplates were prepared by using silica gel G. IR spectroscopic analysis was done by using Shimadzu Fourier Transform Infra Red Spectrophotometer (KBr pellet) (UGC-DAE



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8
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Original Research Article

<https://doi.org/10.20546/ijcmas.2020.904.361>

To Evaluate the Stability of Carbopol 934 based Transdermal Gel of Paracetamol Nanocapsules

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ABSTRACT

The nanocapsules were prepared by the interfacial deposition technique proposed in the year 1989. The required quantity of the drug and benzyl benzoate were mixed and added dropwise in the organic phase containing the polymer PLGA dissolved in the two organic solvents. With continuous stirring at 4000rpm for 1 hour, soyalecithin was added in the above mixture. Finally, the later was added in the solution of Polaxamer 188 with a continuous stirring speed of 4000rpm for 30 minutes. Fine concentrated colloidal dispersion of paracetamol nanocapsules were obtained after the removal of organic solvents and high-speed centrifugation. Then anocapsules were characterized by scanning electron microscopy, zeta potential and particle size analysis. The compatibility of the excipients was analysed by FTIR. The nanogel of paracetamol was formulated with carbopol 934 and triethanolamine as the major ingredients. The transdermal formulation was tested for its in vitro permeation studies through the biomimetic dialysis membrane using Franz diffusion cell and entrapment efficiency was also conducted. The receiver solution was phosphate buffer (pH 7.4) and the permeability study was carried out for 12 hours. The transdermal gel was subjected to accelerated stability tests for 6 months and after this period microbiological tests were performed for common microorganisms. The qualitative and quantitative estimation of viable microorganisms present in the gel was evaluated which includes tests for total viable count (bacteria and fungi) and specified microbial organisms (*Escherichia coli*, *Salmonella typhi*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*). The accelerated stability study showed that the product is stable for the period of 6 months. The microbiological assay established the absence of common microorganisms. Transdermal gel formulation containing paracetamol can be prepared by the interfacial deposition technique using Carbopol 934 as a carrier. *In vitro* drug release data showed better physiochemical characteristics with no skin irritation reactions. Moreover, the accelerated stability test and the microbiological tests assured a stable product.

Keywords

Paracetamol nanocapsules, Accelerated Stability Test, Microbiological tests for organisms, Stability

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Synthesis, characterization and biodegradation of bioplastic films produced from *Parthenium hysterophorus* by incorporating a plasticizer (PEG600)

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Cellulose
Cellulose acetate
Plasticizer

ABSTRACT

The alarming use of fossil fuel based plastics causing hazardous environmental impact has drawn attention towards alternative sources. Therefore, the present study aims to utilize *Parthenium hysterophorus* for the production of bioplastic films and illustrates its biodegradability. A rapid biodegradable bioplastic films were synthesized using cellulose acetate (CA) prepared from *Parthenium hysterophorus* weed by incorporating different concentrations of polyethylene glycol 600 (PEG600) ranging from 0 to 50% w/v (BP00, BP10, BP20, BP30, BP40 and BP50) as plasticizer. The films were evaluated based on their physicochemical and mechanical properties. The highest tensile strength and Young's modulus of 11.5 ± 0.23 MPa and 170 ± 0.89 MPa, respectively have been observed for the BP10. The highest elongation at break of $9.13 \pm 0.12\%$ was exhibited by BP40. The functional groups of the plasticized and unplasticized films were characterized using Fourier transform infrared spectroscopy (FTIR). The bioplastic film BP50 exhibits highest relative crystallinity of 21.27% determined by X-ray diffraction analysis (XRD). All the bioplastic films exhibit a good thermal stability and shows three degradation stages in Thermogravimetric analysis (TGA). The bioplastic films are 69.29% biodegradable in natural conditions in 45 days, while 70.29% and 83.57% degradation are observed under composting and laboratory condition, respectively. Hence, the bioplastic films prepared from *Parthenium hysterophorus* by incorporating PEG600 can be a potential substitute for petroleum based plastics.

1. Introduction

Plastic has transformed everyday human life and is playing a crucial role in influencing every aspect of life. Though, the majority of the plastics are petroleum based which dominates everywhere due to their excellent versatility, mechanical and barrier properties (Gonzalez and Alvarez Igarzabal, 2013; Sanyang et al., 2015). In spite of plentiful advantages of petroleum based plastic; it is a big threat to the environment due to their exceptional resistance to biodegradation (Lopez Rocha et al., 2020; Bhuyar et al., 2018).

The production of petroleum based plastic consumes about 4% of the total extracted fossil fuels as its raw material (Lebreton and Andrady, 2019). The increase in future demand of the plastics by the year 2050 may necessitate 20% of the total fossil fuels extracted globally (Lebreton and Andrady, 2019). The demand for global energy is also estimated to rise sharply, which ultimately cause more dependency on fossil fuels (Aydin, 2014; Aydin, 2015). The excessive use of fossil fuels causes increase in green house gases which is a big threat to the environment (Kone and Buke, 2010). Apart from production, the disposal of plastic waste is also a great challenge. Though, some plastics can be recycled, which requires additional steps like separation, transportation, processing and remanufacturing (Shen et al., 2020). The majority of plastic wastes are incinerated which gives off carbon dioxide (CO₂) and other irritant gases to the atmosphere. The CO₂ is the single most important green house gas which contributes more than half to the global warming today, whose share can increase upto three-fourth by 2100 (Shen et al., 2020).

Nowadays, bioplastics produced from eco-friendly and natural biopolymers like cellulose, starch, proteins, lactic acid, hydroxy alkanates or other materials derived from plant or microorganisms have become a topic of great interest among the researchers worldwide (Joshi et al., 1984; Mostafa et al., 2018). The biodegradation ability of the bioplastics makes them to decompose into inorganic compounds or biomass through enzymatic degradation by variety of microorganisms (Mouafo Tamnou et al., 2021).

Parthenium hysterophorus weed, due to its higher cellulose content, has been used for the extraction of cellulose (Naithani et al., 2008; Varshney and Naithani, 2011; Nigam et al., 2021). A massive quantity

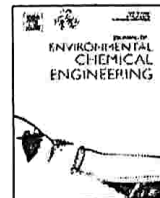
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Valorization of *Parthenium hysterophorus* weed for cellulose extraction and its application for bioplastic preparation

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ABSTRACT

Parthenium hysterophorus, the world's one of the most dangerous weeds, was used in the present study for the extraction of cellulose. The extraction of cellulose from *Parthenium hysterophorus* was optimized using Plackett Burman (P-B) Design and Response Surface Methodology (RSM) involving Box-Behnken Design (BBD). The extracted cellulose was obtained with a maximum yield of 36.43% using 2.5% (wt/vol) of acid, 5.9% (wt/vol) of alkali and 2.6% (wt/vol) of chlorination treatment. The yield of the cellulose found to be 36.43% which was 74% higher than the pre-optimized value of 21%. SEM micrographs of the extracted cellulose showed cleaner surface and fibrillar morphology compared with *Parthenium* biomass. The functional groups of extracted cellulose were characterized by FTIR. The amorphous and crystalline nature of the extracted cellulose was determined by XRD and the Crystallinity Index was calculated as ~55.28. The thermal stability of the extracted cellulose was better than the commercial cellulose and it was stable up to the temperature close to 350 °C. The extracted cellulose was used to synthesize cellulose acetate and was used further for the preparation of bioplastic film. The prepared bioplastic was highly resistant to salt and 10% sulfuric acid, but was labile in the presence of alkali. The produced bioplastic film exhibited tensile strength of 10.8 ± 0.15 MPa, $2.86 \pm 0.28\%$ elongation at break and Young's modulus of 153.61 ± 0.08 MPa. Therefore, *Parthenium hysterophorus* can be a potential source for the preparation of bioplastic and the produced bioplastic can be potentially applied in food, medicine and packaging industries.

1. Introduction

Parthenium hysterophorus L. (Asteraceae) is an invasive weed which was accidentally introduced in India through the seeds imported along with PL 480 wheat grain [1]. It has a great ability to proliferate in favorable condition throughout the year [2]. An enormous amount of *Parthenium* weed is produced annually in the regions of Asia as a natural waste. It is widely distributed at road sides, waste lands, degraded soil, rock crevices and bunds. Management of this weed has become a biggest challenge for agricultural scientists. Various management methods such as mechanical, biological and chemical methods have been approached; but satisfactory solution is still yet to be explored. Hence, the problem of the eradication of this weed can be solved by its utilization for valuable products [3]. *Parthenium hysterophorus* contains 78% holocellulose, 15.8% pentosans and 17.2% lignin; therefore this could be a potential source for the extraction of cellulose and preparation of biodegradable material [3,4]. The most abundant polysaccharide present on the earth

is cellulose. Cellulose is a linear homopolymer of β -D-glucopyranose units having long chain joined by (1→4) glycosidic bonds [5,6]. Cellulose is abundantly present in all plant material and has a broad range of applications over other naturally occurring polymer like proteins and starch [7]. Cellulose is used as a most popular constituent of biomass for more than 150 years due to its universal applicability [8]. Certain plants contain huge amount of cellulose [9,10]. Together with cellulose, hemicelluloses and lignin are the other major components of natural fibers present in the plants. Cellulose is semi-crystalline in nature while hemicelluloses and lignin are amorphous in nature [11].

Varshney and Naithani [4] reported the chemical functionalization of the cellulose extracted from *Parthenium* weed. However, the preparation of bioplastic from the extracted cellulose has not been explored. The cellulose has been extracted from various plant materials including wood fibers [12], sisal fibers [13,14], coconut husk fiber [15], pineapple [16], banana [17], wheat straw [18], ficus leaf fiber [19], jute fiber [19], agricultural waste of onion and garlic [20], sugarcane bagasse [21], rice

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Production of polygalacturonase using *Carica papaya* peel biowaste and its application for pomegranate juice clarification

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Abstract

The present study focuses on utilization of papaya peel for polygalacturonase production in solid-state fermentation (SSF). Papaya peel was screened as optimum solid substrate and valorized under SSF for polygalacturonase production by *Aspergillus niger* AN07 and the effect of different fermentation parameters viz. fermentation time, particle size, moisture content and agitation speed on the enzyme production was investigated. Two fermentation variables viz. moisture content and fermentation time have been identified to significantly affect polygalacturonase production as predicted using Plackett–Burman Design (PBD). It was further optimized by Response Surface Methodology (RSM) using Rotatory Central Composite Design (RCCD). An overall 5.4-fold increase (264.20 U/g dried substrate) in enzyme production was achieved after optimization at fermentation time 144 h and moisture content 90%. The results of RSM showed that the model was in good agreement with experimental results with $R^2 = 99.6\%$ ($P < 0.05$). *A. niger* AN07, *A. tubingensis* MP30, *A. fumigatus* M1 and *A. sydowii* indicated a high growth rate of 0.55, 0.52, 0.39 and 0.25 mm/h, respectively on the optimized solid substrate in SSF. Native PAGE and Zymogram study showed predominant presence of polygalacturonase in the purified preparation. The purified polygalacturonase enzyme significantly increased pomegranate juice clarification by 3.6-fold and prevented haze formation during storage conditions.

Keywords Polygalacturonase · Biowaste · Papaya peel · Solid state fermentation · Response surface methodology

Introduction

Solid State Fermentation (SSF) has several economic advantages that have demanded the researchers' interest in recent years for the production of industrially important enzymes. The SSF process has been reported to be the most suitable because of its high productivity, easy enzyme recovery and cost effectiveness for the production of fungal enzymes

(Viniegra-González et al. 2003; Pandey et al. 2000). The agro-industrial residues are not only economical solid substrates but also suitable for extracellular enzyme production due to low cost of harvesting and thus are considered best suited for production of enzymes in SSF (Mahmoodi et al. 2019). Pectin is the integral part of middle lamella of plant cell wall (Caffall and Mohnen 2009). It is composed of D-galacturonic acids joined together by α -1, 4 glycosidic linkages, in which a few hydroxyl groups are methylated. Pectin methylesterase, polygalacturonase and pectin lyase completely degrade pectin, releasing galacturonic acid units (Combo et al. 2012). Polygalacturonase is a pectinolytic enzyme that hydrolyses pectic substances randomly and produces oligosaccharides. This enzyme has been reported to be produced by higher plants and microorganisms including bacteria and fungi (Uzuner and Cekmecelioglu 2015; Patidar et al. 2018; Aggarwal et al. 2020). Polygalacturonase is mainly used in beverage industries for extraction and clarification of fruit and vegetable juices. Additionally, it has important role in tea and coffee industry, textile industry, animal feed industry, treatment of waste water, protoplast

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REVIEW



Microbial alkaline serine proteases: Production, properties and applications

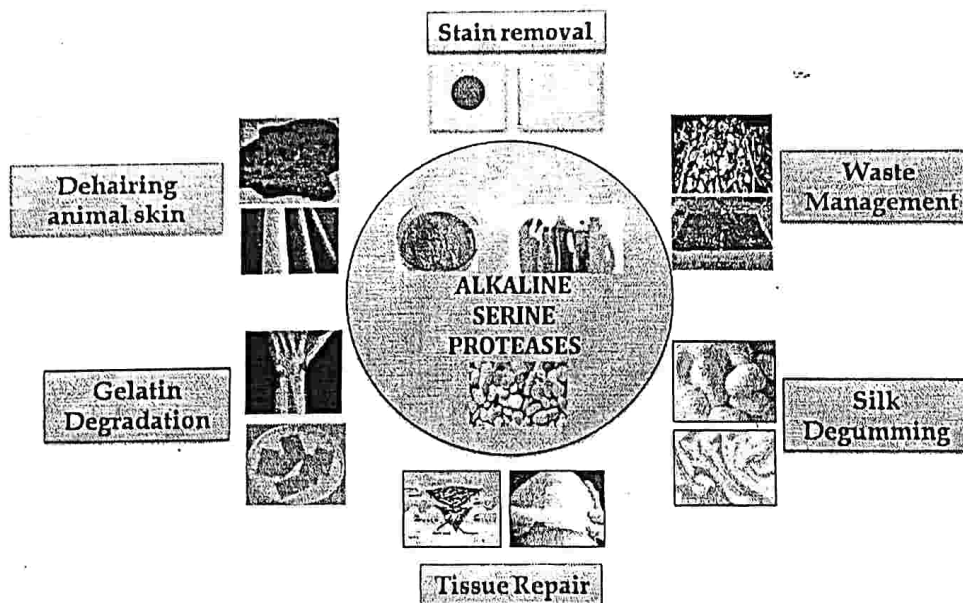
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Abstract

Proteolytic enzymes hold a pivotal position in numerous industrial processes where hydrolysis of protein molecules is required under precise conditions. The emerging trend of biotechnological applications in recent years has witnessed a renewed interest in alkaline serine proteases extending their utility in detergent, leather, textile, food and pharmaceutical industries. A variety of microorganisms have been reported to produce alkaline serine proteases on a large scale, however, extensive research to find an alkaline serine protease with desirable characteristics such as significant catalytic efficiency, expanded stability and broad substrate specificity is still ongoing. Although submerged fermentation dominates the commercial enzyme production, recent reports have emphasized on solid state fermentation technology which can reduce major cost associated with the enzyme production. In the present review, recent research on alkaline serine proteases along with their novel properties and production using solid state fermentation have been discussed.

Graphic abstract



Keywords Alkaline serine protease · Solid state fermentation · Industrial applications · Biochemical properties

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Emerging Trend of Bio-plastics and Its Impact on Society

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Authors' contributions

This work was carried out in collaboration among all authors. Author SS designed the study, performed literature searches and wrote the first draft of the manuscript. Authors FM and SG performed literature searches and improved the first draft of the manuscript. Authors AN and SN also contributed in literature search and improved the manuscript. Author AK designed and supervised the study, gave instructions to all the co-authors, contributed in adding recent references and finalized the manuscript. All authors read and approved the final manuscript.

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Mini-review Article

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ABSTRACT

Bio-plastics are either bio-based polymers or capable of degradation into simple compounds. The rising development in the production and use of bio-plastics has globally revolutionized the dependency on traditional plastics. The conventional plastics prepared from petroleum, coal and natural gas have been extensively used by humans since antiquity as a prime component of almost all the materials used in day to day life. Since, these plastics are non-biodegradable; they cause serious impact on the environment. Recent years have witnessed the introduction of a wide variety of bio-plastics derived from natural polymers such as starch, cellulose, chitin etc. These bio-plastics are now being utilised in packaging materials, electronics, medical devices; holding immense potential for utility in future. This mini-review confers about types of bio-plastics, their utility in different sectors and their future prospective.

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Preventive Load Shedding for Avoiding Line Overload
Under Emergency Conditions Using Sine-Cosine
Technique and Accounting for Distributed Generations

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Pradeep Purey*, Rajesh Arya** and S C Choubey***

At times, emergency load shedding is required based on predicted load in next interval. Under such situations, the load shedding strategy must be planned in anticipation and may be implemented after the load increase or in previous interval itself. In view of this, the paper presents a methodology for optimal load shedding in advance such that operating constraints are satisfied in the present condition and in the next interval predicted load condition. The effect of distribution generation has been considered. Sine-cosine optimization technique has been employed to get minimum load shedding at minimum buses. The algorithm has been implemented on a 14-bus standard test system.

Keywords: Load shed, Severity index, Line overload alleviation, Distributed generation

Introduction

Load shedding is an important issue once the system lands in non-correctable emergency state (Stott *et al.*, 1987). Non-correctable emergency state may arise owing to violations of: (i) line flows; (ii) bus voltages; (iii) stability margin; and (iv) frequency deviations. In each of the above cases, load shedding is required. Many times, if system capability permits load shedding, may be avoided by line switching which may even explore the possibility of line overload rotation (Arya *et al.*, 2000).

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Hajdu *et al.* (1968) presented a methodology for alleviating line overloads using N-R method along with Kuhn-Tucker theorem. Palaniswamy *et al.* (1985) incorporated generator and load characteristics for load shedding. Medicherla *et al.* (1979) used load flow for developing a load shedding algorithm for line overload alleviation. Shah and Shahidehpour (1989) used expert system-based heuristic approach for line overload alleviation. Pande and Arya (2005) applied Hopfield neural network-based optimization for alleviating line overload. Arya and Koshti (2014) developed an algorithm for line overload alleviations employing Teaching Learning-Based Optimization (TLBO) technique.

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रसायनशास्त्र का इत्र बनाने के क्षेत्र में उज्ज्वल भविष्य की सम्भावनाएँ:

लघु एवं गृह उद्योग, स्वरोजगार का एक बेहतर भविष्य

डॉ. ताल कुमार चंदेल

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सार

शोध के माध्यम से रसायनशास्त्र के क्षेत्र में उज्ज्वल भविष्य की सम्भावनाएँ लघु एवं गृह उद्योग स्थापित कर स्वरोजगार प्राप्त कर सकते हैं। इस लेख में इत्र बनाने के विज्ञान को बहुत ही सरल माध्यम से समझाया गया है। जिससे कि आप घर बैठे छोटे स्तर पर इत्र उद्योग की कल्पना को साकार कर स्वरोजगार के अवसर प्राप्त कर सकते हैं।

परिचय

नये-नये पसंदीदा इत्र की खोज दुनिया भर में उपभोक्ताओं की माँग के अनुसार विकसित होती है। अनुसंधान और विकास एक महीने और समय लेने वाली प्रक्रिया है, लेकिन विकास के लिए बहुत ही महत्वपूर्ण भूमिका रखती है। दुनिया भर में बढ़ती प्रतिस्पर्धा के साथ नये-नये तरीके खोजने में अनुसंधान और विकास, एक महत्वपूर्ण भूमिका निभा रहा है। इस लेख में इत्र और खुशबू उद्योग के बारे में बताया जा रहा है। नये सुगंधों के लिए नए फार्मूले लगातार विकसित किए जा रहे हैं^१, और वाणिज्यिक बिक्री को बढ़ाने के लिए नये सुगंध व इत्र में बदलाव किए जा रहे हैं, ताकि ज्यादा मात्रा में सुगंध व इत्र की बिक्री हो। इत्र कला एक प्रकार की यह सुगंधित यौगिक क्रिया है^२, जो आमतौर पर इथेनॉल-जल व खुशबू का मिश्रण है। यह तीन परत में रहता है। इत्र बनाने के लिए सबसे पहले विभिन्न संकेतों को जानते हैं, जिन्हें नोट कहते हैं। इन्हीं नोटों को तीन प्रकार से पारम्परिक खुशबू पिरामिड आकृति (चित्र क्रमांक-१) में प्रदर्शित किया गया है। जो इस प्रकार है:-

१. शीर्ष नोट जैसे - मीठा नींबू, नारंगी, कागजी नींबू, इत्यादि की सुगंध। इस नोट में यह बताया है कि, सबसे पहले कौन सी सुगंध महसूस होती है। आमतौर पर ये सुगंध १० से १५ मिनट तक रहती है।
२. मध्य नोट जैसे- गुलाब का तेल, लेवेंडर का तेल, चमेली का तेल, बेला का तेल इत्यादि। शीर्ष नोट के खत्म होने के बाद मध्य नोट महसूस होता है। यह नोट ३० मिनट तक ही स्थिर रहता है। यह सुगंध कोर को निर्धारित करता है कि 'इत्र' किस परिवार से तालुका रखता है। उदाहरण के लिए गुलाब के ताजा फूल और अन्य फूल इत्यादि।
३. मूल नोट/आधार नोट जैसे - चन्दन, जायफल, शीशम, शहद, कालीमिर्च, दाल चीनी, इत्यादि जो कि स्थाई नोट होता है और मध्य नोट के बाद महसूस होता है। यह आम तौर पर ५-६ घंटे तक आप की त्वचा पर स्थिर रहता है।



सूक्ष्म पदार्थ: एक सामान्य परिचय

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स्टडीज इन्दौर, [म.प्र.], ४५२००१

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प्रोफेशनल साइन्सेस इन्दौर, [म.प्र.], ४५२००१

सार

पिछले कुछ वर्षों से दुनिया भर में शोध के माध्यम से विकसित की गयी नई-नई खोज देखने को मिली है। जो ये दर्शाती है कि सूक्ष्म पदार्थ शोध क्षेत्र में काम करने वाले शोधार्थी एवं शोध समूह की संख्या में विस्फोट की भाँती वृद्धि हुई है। सूक्ष्म पदार्थ से बने औषधि एवं उपकरण जैसे नयी कैंसररोधी नैनो-औषधि, नैनो-थर्मामीटर, कैमरों और सेंसरों, कार्बनिक सौर सेल्स इत्यादि अध्ययन से हमने देखा, कि नैनो पदार्थ का योगदान बहुत ही सराहनीय है जो समाज और पूरे जगत के लिए उपयोगी है। इस लेख में सूक्ष्म पदार्थ, नैनो-कण, नैनोसंरचना एवं नैनोतकनीकी का एक सामान्य परिचय बताया जा रहा है।

परिचय

नैनो एक ग्रीक शब्द है। जिसका हिन्दी में अर्थ सूक्ष्म या अत्यन्त छोटा होता है। गणित में नैनो उपसर्ग का अर्थ एक के अरबवें भाग को (10^{-9} वे भाग) दर्शाता है। किसी पदार्थ को नैनो स्तर पर बदलाव करने के लिए जिस तकनीक का प्रयोग करते हैं उसे नैनो तकनीक तथा उस पदार्थ को नैनो पदार्थ कहा जाता है। अपने सूक्ष्म आकार, विशाल सतह क्षेत्र और अपने आसपास के वातावरण के साथ तीव्र अन्योन्य क्रिया के कारण ये पदार्थ अत्यन्त सक्रिय होते हैं। समान्यतः नैनो पदार्थ का यांत्रिक, प्रकाशिक, चुंबकीय, विद्युतीय गुण आकार के आधार पर बदल जाता है। इन्हीं विशेषताओं के कारण वैज्ञानिक इस पदार्थ के प्रति आकर्षित हो रहे हैं और विकास की नयी संभावनाओं की खोज में कार्य कर रहे हैं। सन १९९१ में कार्बन नैनो ट्यूब की खोज से नैनो पदार्थ शोध में एक नया मोड़ आया। इस खोज के बाद, नैनो पदार्थ के क्षेत्र में काम करने वाली अनुसंधान समूहों की संख्या में भारी वृद्धि हुई।

नैनो पदार्थ एक ही रचना के साथ 'स्थूल' पदार्थ से भिन्नता प्रकट करते हैं, और कई दिलचस्प अनुप्रयोगों के लिए अनुमति देते हैं। नैनो विमाओं पर, क्वांटम प्रभाव, कई अनुप्रयोगों की अनुमति देता है। नैनो-तकनीकी के कुछ अनुप्रयोगों में वैकल्पिक ऊर्जा, इलेक्ट्रॉनिक्स, उत्प्रेरक, जैव औषधि, बैटरी, और शुद्धिकरण जल उपचार सामग्री शामिल है [१]।

नैनो संरचना तथा आकार

नैनो तकनीक के उपयोग के विकास और अनुसंधान में संभावनाओं का सबसे बड़ा कारण इसका नैनो आकार ही है, जिससे पदार्थ के मूल गुण बदल जाते हैं तथा हम ये भलीभाँति जानते हैं कि, संरचना और आकार पर पदार्थ के कई गुण निर्भर करते हैं जैसे- रंग, विलेयता, पारदर्शिता, गलनांक, ज्वलनशीलता, विसरण, प्रष्टीय परमाणुओं की संख्या, प्लास्टिक व्यवहार उत्प्रेरकीय गुण, प्रतिरोधकता तथा चालकता, इलेक्ट्रॉन की सान्द्रता, आयनन ऊर्जा इत्यादि और नैनो पदार्थ में भी एक ही तत्व की संरचना और आकार परमाणु/ अणु की संख्या, व्यवस्था के आधार पर बदल जाते हैं। अतः हम कह सकते हैं कि, कणों के आकार की एक महत्वपूर्ण भूमिका होती है।

Antimicrobial Peptides in Plants: Classes, Databases, and Importance

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Abstract

Plant antimicrobial peptides (AMPs) are diverse molecules crucial in host defense mechanisms. These natural compounds display broad-spectrum antimicrobial activities and also play a significant role as immune modulators and anti-infective agents. They are classified into different families like defensins, thionins, cyclotides, snakins, and several others, based on the variation in their structure, the composition of amino acids, number of disulfide bonds, and mechanism of action. The ascending number of drug-resistant plant and animal pathogens has pushed researchers to search for novel peptides, which can be utilized as alternatives to chemical antibiotics. In addition, the exhaustive genomic and proteomic data available on the cyberspace encourage the development of peptide libraries used for the prediction of unexplored peptides, thus saving time and cost for wet-lab experimentation. Understanding the insights of the structure and function of plant AMPs would offer excellent opportunities to expand their use as therapeutics in pharmaceutical and agricultural industries. This study reviewed the basis of plant AMPs, provided information on recent advancements in omic tools, and updated newly added peptides in the databases. The potential application of these peptides in human healthcare and agribusiness was also discussed.

Keywords: antimicrobial peptides, plant proteins, protein database, therapeutics, defensin

Introduction

Antimicrobial peptides (AMPs) belong to a diverse group of bioactive molecules ranging from 10 to 100 amino acid residues in length [1]. Originally, these peptides were known to possess antagonistic action against numerous pathogens, including bacteria, fungi, viruses, protozoa. Recent discoveries have expanded their functions as immune modulators, antihypertensive molecules, anticancer, and antitumor agents [2,3]. Nowadays, AMPs are considered a fundamental component of the innate immune system [4]. These bioactive peptides have been naturally and synthetically derived from various prokaryotic and eukaryotic systems. Natural AMPs have been isolated from plants, amphibians, insects, mammals, fungi, bacteria, etc. [5,6]. Recent evidence of increasing resistance of microbes against antibiotics has drawn attention towards the use of peptides as novel therapeutics for the treatment of various Gram-positive and Gram-negative infections [7]. The use of AMPs in medicines has emerged rapidly because of their broad-spectrum activity and safety.

Additionally, pathogens are unlikely to develop resistance against these peptides as compared to antibiotics.

Plants produce defensive molecules in response to the invasion of pathogens. An array of peptides isolated from different parts of the plants, namely roots, seeds, flowers, stems, and leaves, has demonstrated antimicrobial activity against phytopathogens, as well as pathogenic bacteria causing infection in human beings [8]. Based on the amino acid sequence homology, the main families of plant AMPs comprise defensins, thionins, lipid-transfer proteins, cyclotides, snakins, and hevein-like proteins [9]. The key features defining plant AMPs are that they are enriched in cysteine and glycine and the presence of disulfide bridges [10]. The major challenges faced by these compounds are the development of intrinsic toxicity in plants, lesser stability, and cost of production, restricting their use for commercial applications. With the advancement in biotechnological techniques, these peptides can serve as an attractive tool in the agriculture field for increasing crop yields [11].

This article summarized different AMPs found in plants and updated the recent progressions by searching plant AMPs

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A novel thiol-dependent serine protease from *Neocosmospora* sp. N1

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ABSTRACT

Alkaline proteases have several industrial applications. In the present study, newly isolated *Neocosmospora* sp. N1 was screened as hyper producer of serine protease. A multimeric protease of the fungus was purified to homogeneity till 96.78 fold purification with 22.51% recovery. The homogeneity of purified enzyme was checked by native PAGE and its molecular weight was found to be 198.03 kDa by MALDI-TOF. On SDS-PAGE analysis, enzyme was found to be a hetero oligomer of 17.66 kDa and 20.89 kDa subunits. The purified enzyme showed maximum activity with casein as substrate at 60 °C and pH 8.5. The K_m and V_{max} values were found to be 0.015 mg/ml and 454.45 U/ml, respectively. The enzyme was completely inhibited by PMSF, while the activity was 40% enhanced using β -mercaptoethanol, suggesting that it is a thiol-dependent serine protease. The purified protease was active over an alkaline pH range from 7 to 12 and temperatures from 20 °C to 60 °C. The enzyme exhibited excellent stability, almost 100% towards organic solvents such as toluene, benzene and hexane, surfactants such as Triton X-100, Tween-20, Tween-80 and SDS, as well as commercial detergents. The significant properties of purified enzyme assure that it could be a potential candidate for commercial purposes.

1. Introduction

Proteases (peptidases or proteinases) are found in all living organisms playing a vital role in metabolic and physiological processes [1]. They catalyze the hydrolysis of peptide bonds in protein molecules [2]. Proteases not always fit clearly into the international system for the classification and nomenclature of enzymes (EC number) because of their diversified and complex nature [3]. However, they can be classified according to their source (animal, plant or microbial), catalytic action (endo or exopeptidases), pH, molecular size, charge or substrate specificity and nature of active site [4]. Ever since the advent of protein structure and homology modelling, other forms of classification such as MEROPS databases have been proposed which is based upon the chemical structure and information about evolutionary relationship of proteins [5].

The worldwide sale of industrial enzymes accounts to US \$ 300–600 million per annum, 75% share is held by hydrolytic enzymes, of which two thirds are proteolytic enzymes [6]. Microorganisms largely contribute to the production of intracellular and extracellular enzymes utilized in biotechnological and industrial applications [7]. Proteases exploited commercially are mostly derived from microorganisms like

bacteria, yeast and fungi [8]. Although, there are many microbial sources available for producing proteases, only few are recognized as commercial producers. In recent years, proteases from other sources like insects, plants, mushrooms etc. have also been reported [9, 10, 11]. Extracellular alkaline proteases contribute to 25% of total microbial enzyme sales [12] encompassing widespread applications in industrial sectors such as laundry [13], leather [14], silk [15], pharmaceutical [16], nutrition [17], silver recovery [18] etc.

The escalating demand of alkaline proteases in various industries entails the need of definite properties of enzyme like thermal stability profile, catalytic efficiency at higher pH, substrate specificity, kinetic studies, activity and stability in presence of organic solvents, surfactants etc. [19, 20, 21]. *Bacillus* derived alkaline proteases are stable at elevated temperatures and pH, but a majority are incompatible with detergent matrices [22, 23]. Therefore, high performance alkaline proteases are being sought for commercial exploitations, especially for detergents. Proteases from microbial origin have long been used in industry. Nowadays, filamentous fungi are preferred over other microbial sources because of their biochemical diversity, growth on cost effective substrates such as those used in SSF, bulk production of extracellular enzymes, ease in recovery of product from fungal biomass and suitability to

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ABSTRACT

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ABSTRACT

Alkaline proteases find extensive applications ranging from detergent industries to therapeutics due to their broad alkaline range activity. The present work describes the first report on optimization of alkaline protease production from *Neocosmospora* sp. N1 and explores its utility in detergent and leather industries. Wheat bran was found to be a suitable substrate for protease production under solid state fermentation amongst several low cost agro-based materials used in this study. Protease production was enhanced when wheat bran was supplemented with a novel inducer, custard apple seed powder in the ratio of 4:1 which increased enzyme production up to 1.88 fold. One factor at a time approach was used to select parameters important for production and response surface methodology was used for further optimization. The optimum level was attained at 123 h fermentation time, 63% moisture content, 1×10^8 spores/ml inoculum size and 1.4 mm particle size which resulted in 3.12 fold increase in protease production. The partially purified enzyme exhibited maximum activity at 60 °C and was active over a wide pH range of 8–12. Protease was compatible with various laundry detergents viz. Tide, Surf Excel, Ariel, Wheel etc. showing more than 80% stability even after 3 h of incubation and was efficient in removing blood stain from the cotton cloth. The enzyme was also more efficient in dehairing goat skin as compared to conventional leather processing treatment.

Protease enzymes are ubiquitous in nature catalysing hydrolysis of protein molecules into peptides and amino acids (Sumantha et al., 2006). In fact, proteases make up the largest single family of enzymes engrossing several bioengineering and biotechnological applications. Alkaline proteases from the array of proteases, account for almost 40% of the total worldwide sales of enzymes owing to their activity and stability under harsh operational conditions (Wahab and Ahmed, 2018). Ever since the advent of biotechnology, alkaline proteases, primarily subtilisin derived from *Bacillus* species have served as an essential ingredient of modern laundry detergents (Maurer, 2004). The performance of a high grade detergent protease depends upon several parameters such as degradation of protein stain, compatibility with detergent components like surfactants, complex agents, perfumes and other enzymes, stability in the presence of oxidizing agents such as

bleach and shelf life in detergent formulations (Vojcic et al., 2015). Advances in improving performance of detergent proteases are ongoing in terms of cost effectiveness, superior washing performance with fabric care and improved stability. Hence, spotlight on subtilisin like proteases derived from fungal species having robust properties have gained much interest in recent years. Fungi are known to secrete extracellular enzymes in large amounts and are a preferred choice for enzyme production due to ease in downstream processing. Recently, alkaline proteases have also gained prime importance in leather industries for their ability to dehair animal skin in a safe and eco-friendly manner (Sujitha et al., 2016). The foremost step in conventional leather processing makes use of lime and sulphide for removing hairs from animal skin. This process discharges considerable amount of harmful effluent causing severe impact on water and soil. Additionally, the inability to have precise control over the chemical reaction can cause skin damage and loss of hair and wool (Khandelwal et al., 2015). Therefore, proteases may serve as a greener alternative, replacing the use of toxic chemicals in leather

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An overview on preparation and characterization of activated jetropha husk carbon

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Abstract

Activated carbon is amorphous carbon which exhibit high degree of micro porosity and large surface area. Jetropha curcas is an important plant for the production of biodiesel. In the production of biodiesel huge volume of jetropha husk is generated which are consider as biodiesel waste. Jetropha husk is efficient raw material for the preparation of activated carbon. This paper reviews 103 research papers from 1991 to 2017 on study of characteristics of activated carbon prepared from Jetropha husk. Different researcher focus on physico-chemical characterization of activated jetropha husk carbon using XRD, SEM, FT-IR and TGA analysis. Physical properties such as ash content, moisture content, volatile matter content, surface area, CHNS analysis, pH and porosity were studied and analyzed in detail by different author.

Keywords: Activated carbon jetropha husk (AJHC), biodiesel waste, chemical activation, characterization.

Introduction:

Activated carbon is a form of amorphous carbon with small, low volume pores that increase the surface area available for adsorption. Activated carbon is prepared by that organic substance which have high amount of carbon⁶⁷. Agricultural waste is one of the best choice because it contain high amount of carbon as well as its cost is low⁷⁰. Many researcher prepared activated carbon using various agricultural waste such as rice husk^{18, 19, 20, 21}, soyabean hull²², maize cob^{23,24,25,26}, almond and apricot shell²⁷, cajanias Cajan^{28,29,30}, sawdust^{31,32}, sugar-cane baggase^{33,34}, jetropha husk^{3,5,7}.

Jetropha Husk is poor in nutrients so that it cannot be used as agricultural fertilizers but it is rich in cellulose, hemicelluloses and lignin which is difficult to digest and degrade therefore converting this waste into valuable activated carbon is finest option².

Jatropha husk is the waste product of jatropha curcas plant which is a soft weeded deciduous shrub is also known as ratanjyot³⁵, jamalgota³⁵, chandrajyot³⁵, physic nut^{36,82} etc. It is a wildy growing hardy plant, in arid and semi-arid regions of the country on degraded soils having low fertility and moisture³⁵ and can live for about 50 years⁷¹. It is a tropical plant that can be grown in low to high rainfall areas either in the farms as a commercial crop or on the boundaries as a hedge to protect fields from grazing animals and to prevent and control erosion^{36,71}. The crops of Jatropha curcas belongs to the family Euphorbiaceae, which is comprised of approximately 8000 species belonging to 321 genera⁴. Now a days these crop is planted as commercial crop because it is economically important in the production of oil which is an important replacement of petroleum based diesel fuel.

Preparation of activated carbon is completed in two steps that is carbonization of raw jetropha husk in an inert atmosphere and than activation of the carbonized material either by physical activation or chemical activation

FLY ASH AS A ADSORBENT FOR REMOVAL OF HEAVY METAL: A REVIEW

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Abstract: Adsorption is a fundamental process in the physicochemical treatment of wastewaters. The coal fly ash is a waste material that generate from industrial processes. It is a cheap, eco-friendly and bio degradable material. Long term exposure of human bodies to heavy metals susceptible to receives various infection and diseases from an environmental and economic perspective. Adsorption is acceptable process that can be applied in wastewater treatment, these waste materials pollute our environment or ecosystem and pose the problem of their disposal so "use waste to treat the water" is the concept to avoid the environment pollution. The application of available adsorption models such as the isotherm, kinetics and thermodynamics as well as the influence of parameter on metal adsorption by low cost adsorbent shall be reviewed to understand the adsorption mechanism of low-cost adsorbent. In this review study the chemical composition of different coal fly ash and fly ash for the removal of heavy metal ions are summarized.

Keywords: Fly ash, Heavy metals, Adsorption, Environment, Wastewater.

Introduction

Quality of water and management of waste is most important proposition in human life. Accretion of technologies in industrialization and urbanization lead to increase in percentage accumulation of waste all around the globe and release of heavy metal in the water streams from different activities such as industrial, agricultural and domestic¹.

Water is a basic source of life and thus is essential element to all living things on earth. Technological development and industrial activities cause heavy metal pollution is posing significant threats to the public health and environment because of its toxicity, non-biodegradability, bioaccumulation and persistent tendency through food chain².

Process of adsorption is operate in chemical, biological and physical system for the use of removing substances from any liquid or gaseous solution. Adsorption process involve separation of a substance from one phase accompanied by its concentration at the surface of another involves adsorption. Adsorption efficiency depends on activated carbon, temperature, pH and adsorbate. Heavy metals from industrial wastewater can be removed by adsorbent³. Heavy metals are toxic in nature therefore it is essential to remove from wastewater. Adsorption is very common method for removal of heavy metals from wastewater. So many researchers used fly ash as adsorbent for removal of organic material and heavy metals from wastewater⁴.

The aim and objective of this review paper is to provide fundamental information and literature in fly ash as a adsorbent for removal of heavy metals.



Composition of fly ash

Fly ash particles are generally spherical in shape and range in size from $0.5\mu\text{m}$ to $100\mu\text{m}$ ⁵. Fly ash material solidifies while suspended in the exhaust gases and is collected by electrostatic precipitators or filter bags. Table 1 showed the chemical composition of coal fly ashes.



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Gamma irradiation induced effects on *in vitro* shoot cultures and influence of monochromatic light regimes on irradiated shoot cultures of *Dendrobium sonia* orchid

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ABSTRACT

The effects of gamma radiation and monochromatic lights on growth of *in vitro* shoot cultures of orchid, *Dendrobium sonia*, were investigated. The gamma irradiated shoot cultures grown under white, blue, yellow and red monochromatic lights exhibited differential growth pattern. Shoot cultures gamma irradiated at 15–45 Gy showed reduced shoot length, fresh weight and leaf area. The monochromatic light significantly influenced survival rate and growth of irradiated shoots. The yellow and red light treatments positively influenced survival of gamma irradiated shoots with significant increase in fresh weight, shoot length and chlorophyll content. Yellow light was found to be most effective as leaf area was increased across the radiation dose range (15–100 Gy) compared to red light. The results demonstrated that the method of post-irradiation exposure could be useful to improve growth of gamma irradiated *in vitro* shoots, and help to recover orchid mutants with novel modifications.

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1. Introduction

Radiation mutagenesis has become an established tool in plant breeding with significant contribution to crop improvement by improving existing cultivars [1,2]. There is a great interest in developing mutants of ornamental plants for flower shapes and colors [3] as the species are amenable to mutation induction and selection based on flower color and plant type mutations is relatively easy [4]. Of the >3200 officially released, improved mutant plant varieties, more than 625 belong to ornamental plant category, improved for flower type, leaf size, pigmentation, photoperiodic response and early flowering [5,6].

Orchids are the popular ornamental plants among the members of the *Orchidaceae* that constitute the largest botanical family of higher plants [7]. These ornamental plants are known for their long lasting fragrance and quality of flowers. In India, orchids are mainly grown in the north-eastern region in the dense evergreen forests under conditions of low temperature and high humidity [8]. The genus *Dendrobium* is the largest genus belonging to *Orchidaceae* with most members being epiphytic. *Dendrobium* has

approximately 1500 species and almost one fourth of them are used for their high ornamental value [9]. Because of their commercial value in the horticulture sector, development of new and novel orchid varieties having exotic color, size and shape of flowers under diverse agro-climatic conditions has become an attractive option [10]. One of the breeding strategies for orchids is through induced mutation in which orchid plants or cells are exposed to mutagens such as gamma rays, x-rays, electrons or ion beams or chemical agents [10]. Among the targeted breeding traits for orchid mutants are flower color, sizes, morphology and shelf life as well as plant architecture and vigor. Although several new mutant varieties have been developed in ornamental plants using gamma radiation and are propagated for new traits [11–13], only few mutant varieties of *D. sonia* have been successfully generated through mutagenesis namely 'Keena Oval', 'Ahmad Sobri', 'Keena radiant' and 'Hieng Ding' [14].

In vitro organogenesis is the process where *de novo* organs can be induced from cultured tissues (explants), under the influence of certain physical and chemical conditions such as the type of explants, basal medium, growth regulators, carbohydrate source, light, and temperature [15]. *In vitro* cell and tissue cultures provide several advantages for mutation breeding, as sufficient, high amount of *in vitro* material can be generated for mutagenesis and ease in post-mutagenesis handling [16]. However, the method is often challenged by lower mutation induction frequencies and

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MAGNETIC FIELD AND ITS IMPACT ON PLANT GROWTH AND DEVELOPMENT

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ABSTRACT

Plant magnetobiology has become an important topic to study and manage biological effects on plants. Studies over the past several years have paved its way as a new advancement for achieving enhanced growth and development in crop plants including horticultural plants. An emphasis has been made upon the use of this technique with different magnetic field intensity and exposure. The precise mechanism of its action is not known, but biological and chemical cues are being studied as possible mechanisms. This article presents an overview of 'magneto priming' for the enhancement of growth and yield of various plants.

INTRODUCTION

All the living organisms in this ecosystem are under the influence of Earth's geomagnetic field (GMF) and it is believed that all the life forms have evolved in the presence of GMF- whether it be geotaxis in magnetotactic bacteria, cellular responses in humans or stimulation of growth in plants (Lefèvre and Bazylinski 2013). A magnetic field (MF) is a vector field in the neighborhood of constant magnets or electric currents that is specified by both direction and strength and is characterized by magnetic flux density (measurement in T) and MF strength (measurement in amperes [A]/meter [m]). The magnitude of the Earth's magnetic field at its surface ranges from 25 to 65 μ T (0.25 to 0.65 gauss). A German botanist in 1930 Ssawostin first reported faster growth stimulation of wheat coleoptiles under magnetic fields followed by Murphy in 1942 concluding that germination rate of different types of seeds would accelerate under MF treatment. Developments in the area of magnetobiology began in the 1960's with the development of space biology and the effects on different life forms separately including studies on migratory birds (Wiltshko and Wiltshko 1972) and honeybees (Gould 1980). In the subsequent period, magnetoorientation of magnetotactic bacteria (Blackmore 1982) was studied under bacterial magnetotaxis.

Initial studies of MF effects on plants were conducted by Krylov and Taronkova (1960) who experimented seed germination under MF treatment and suggested that the effects were mostly anauxin-like and termed the phenomenon, magnetotropism. There have been several studies on the effects of plants and these have been reviewed (Maffei 2014). To investigate the magneto sensitivity of plants, four different types of magnetic fields have mainly been employed: (1) weak static homogeneous magnetic fields, (2) strong homogeneous magnetic fields, (3) strong in-homogeneous magnetic fields and (4) extremely low frequency (ELF) magnetic fields of low to moderate magnetic flux densities.

Studies have shown that magnetic fields have significant effect on seed germination, plant growth, development, and yield, depending upon a specific species and on the characteristics of field exposure such as intensity and duration with difference in their growth pattern (Teixeira da Silva and Dobránszki 2016). For example, a significant decrease in the cell number of onion (*Allium cepa*) meristems has been observed. Barley (*Hordeum vulgare*) seedlings grown in Helmholtz coils with a 10 nT MF intensity showed a decrease in fresh weight of shoots and roots, as well as dry weight of shoots and roots in comparison with GMF controls. In another study, it was concluded that very low MF was capable of delaying both organ formation and development (Lebedev et al., 1977). Belyavskaya (2004) found that weak electromagnetic fields suppressed the growth of plants, reduced cell division, intensified protein synthesis and disintegration in plant roots. Sunflower (*Helianthus annuus*) seedlings exposed to 20 μ T vertical MF showed small, but significant increases in total fresh weights, shoot fresh weights, and root fresh weights, whereas dry weights and germination rates remained unaffected (Fischer et al., 2004). However, the best results have been observed for the plants exposed to Electro magnets. Electromagnetic Fields (EMFs) have magnetic and electrical properties that surround objects with an electrical charge which will interact with other objects within that field. At present, there is a growing tendency to use either strong homogeneous or in-homogeneous field for the treatment of seeds for improving their performance (Shine et al. 2012).

EFFECTS ON GERMINATION RATE AND ROOT AND SHOOT INITIATION

Several studies proved the positive effect of Magnetoprimed seeds with significant and rapid germination and early root and early morphogenesis giving rise to the possibility that magnetism can increase the speed of plant development. Many studies have suggested positive effects in MF treated seeds of agricultural importance or with ornamental value. Groundnut seeds had shown an increase in germination rate and vigorous seedling



A novel thiol-dependent serine protease from *Neocosmospora* sp. N1

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ARTICLE INFO

Keywords:

Microbiology
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ABSTRACT

Alkaline proteases have several industrial applications. In the present study, newly isolated *Neocosmospora* sp. N1 was screened as hyper producer of serine protease. A multimeric protease of the fungus was purified to homogeneity till 96.78 fold purification with 22.51% recovery. The homogeneity of purified enzyme was checked by native PAGE and its molecular weight was found to be 198.03 kDa by MALDI-TOF. On SDS-PAGE analysis, enzyme was found to be a hetero oligomer of 17.66 kDa and 20.89 kDa subunits. The purified enzyme showed maximum activity with casein as substrate at 60 °C and pH 8.5. The K_m and V_{max} values were found to be 0.015 mg/ml and 454.45 U/ml, respectively. The enzyme was completely inhibited by PMSF, while the activity was 40% enhanced using β -mercaptoethanol, suggesting that it is a thiol-dependent serine protease. The purified protease was active over an alkaline pH range from 7 to 12 and temperatures from 20 °C to 60 °C. The enzyme exhibited excellent stability, almost 100% towards organic solvents such as toluene, benzene and hexane, surfactants such as Triton X-100, Tween-20, Tween-80 and SDS, as well as commercial detergents. The significant properties of purified enzyme assure that it could be a potential candidate for commercial purposes.

1. Introduction

Proteases (peptidases or proteinases) are found in all living organisms playing a vital role in metabolic and physiological processes [1]. They catalyze the hydrolysis of peptide bonds in protein molecules [2]. Proteases not always fit clearly into the international system for the classification and nomenclature of enzymes (EC number) because of their diversified and complex nature [3]. However, they can be classified according to their source (animal, plant or microbial), catalytic action (endo or exopeptidases), pH, molecular size, charge or substrate specificity and nature of active site [4]. Ever since the advent of protein structure and homology modelling, other forms of classification such as MEROPS databases have been proposed which is based upon the chemical structure and information about evolutionary relationship of proteins [5].

The worldwide sale of industrial enzymes accounts to US \$ 300–600 million per annum, 75% share is held by hydrolytic enzymes, of which two thirds are proteolytic enzymes [6]. Microorganisms largely contribute to the production of intracellular and extracellular enzymes utilized in biotechnological and industrial applications [7]. Proteases exploited commercially are mostly derived from microorganisms like

bacteria, yeast and fungi [8]. Although, there are many microbial sources available for producing proteases, only few are recognized as commercial producers. In recent years, proteases from other sources like insects, plants, mushrooms etc. have also been reported [9, 10, 11]. Extracellular alkaline proteases contribute to 25% of total microbial enzyme sales [12] encompassing widespread applications in industrial sectors such as laundry [13], leather [14], silk [15], pharmaceutical [16], nutrition [17], silver recovery [18] etc.

The escalating demand of alkaline proteases in various industries entails the need of definite properties of enzyme like thermal stability profile, catalytic efficiency at higher pH, substrate specificity, kinetic studies, activity and stability in presence of organic solvents, surfactants etc. [19, 20, 21]. *Bacillus* derived alkaline proteases are stable at elevated temperatures and pH, but a majority are incompatible with detergent matrices [22, 23]. Therefore, high performance alkaline proteases are being sought for commercial exploitations, especially for detergents. Proteases from microbial origin have long been used in industry. Nowadays, filamentous fungi are preferred over other microbial sources because of their biochemical diversity, growth on cost effective substrates such as those used in SSF, bulk production of extracellular enzymes, ease in recovery of product from fungal biomass and suitability to

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Enhanced production of alkaline protease by *Neocosmospora* sp. N1 using custard apple seed powder as inducer and its application for stain removal and dehairing

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ABSTRACT

Alkaline proteases find extensive applications ranging from detergent industries to therapeutics due to their broad alkaline range activity. The present work describes the first report on optimization of alkaline protease production from *Neocosmospora* sp. N1 and explores its utility in detergent and leather industries. Wheat bran was found to be a suitable substrate for protease production under solid state fermentation amongst several low cost agro-based materials used in this study. Protease production was enhanced when wheat bran was supplemented with a novel inducer, custard apple seed powder in the ratio of 4:1 which increased enzyme production up to 1.88 fold. One factor at a time approach was used to select parameters important for production and response surface methodology was used for further optimization. The optimum level was attained at 123 h fermentation time, 63% moisture content, 1×10^8 spores/ml inoculum size and 1.4 mm particle size which resulted in 3.12 fold increase in protease production. The partially purified enzyme exhibited maximum activity at 60 °C and was active over a wide pH range of 8–12. Protease was compatible with various laundry detergents viz. Tide, Surf Excel, Ariel, Wheel etc. showing more than 80% stability even after 3 h of incubation and was efficient in removing blood stain from the cotton cloth. The enzyme was also more efficient in dehairing goat skin as compared to conventional leather processing treatment.

1. Introduction

Protease enzymes are ubiquitous in nature catalysing hydrolysis of protein molecules into peptides and amino acids (Sumantha et al., 2006). In fact, proteases make up the largest single family of enzymes engrossing several bioengineering and biotechnological applications. Alkaline proteases from the array of proteases, account for almost 40% of the total worldwide sales of enzymes owing to their activity and stability under harsh operational conditions (Wahab and Ahmed, 2018). Ever since the advent of biotechnology, alkaline proteases, primarily subtilisin derived from *Bacillus* species have served as an essential ingredient of modern laundry detergents (Maurer, 2004). The performance of a high grade detergent protease depends upon several parameters such as degradation of protein stain, compatibility with detergent components like surfactants, complex agents, perfumes and other enzymes, stability in the presence of oxidizing agents such as

bleach and shelf life in detergent formulations (Vojcic et al., 2015). Advances in improving performance of detergent proteases are ongoing in terms of cost effectiveness, superior washing performance with fabric care and improved stability. Hence, spotlight on subtilisin like proteases derived from fungal species having robust properties have gained much interest in recent years. Fungi are known to secrete extracellular enzymes in large amounts and are a preferred choice for enzyme production due to ease in downstream processing. Recently, alkaline proteases have also gained prime importance in leather industries for their ability to dehair animal skin in a safe and eco-friendly manner (Sujitha et al., 2018). The foremost step in conventional leather processing makes use of lime and sulphide for removing hairs from animal skin. This process discharges considerable amount of harmful effluent causing severe impact on water and soil. Additionally, the inability to have precise control over the chemical reaction can cause skin damage and loss of hair and wool (Khandelwal et al., 2015). The above proteases may serve as a greener alternative, replacing the use of toxic chemicals in leather

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Antimicrobial Peptides in Plants: Classes, Databases, and Importance

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Abstract

Plant antimicrobial peptides (AMPs) are diverse molecules crucial in host defense mechanisms. These natural compounds display broad-spectrum antimicrobial activities and also play a significant role as immune modulators and anti-infective agents. They are classified into different families like defensins, thionins, cyclotides, snakins, and several others, based on the variation in their structure, the composition of amino acids, number of disulfide bonds, and mechanism of action. The ascending number of drug-resistant plant and animal pathogens has pushed researchers to search for novel peptides, which can be utilized as alternatives to chemical antibiotics. In addition, the exhaustive genomic and proteomic data available on the cyberspace encourage the development of peptide libraries used for the prediction of unexplored peptides, thus saving time and cost for wet-lab experimentation. Understanding the insights of the structure and function of plant AMPs would offer excellent opportunities to expand their use as therapeutics in pharmaceutical and agricultural industries. This study reviewed the basis of plant AMPs, provided information on recent advancements in omic tools, and updated newly added peptides in the databases. The potential application of these peptides in human healthcare and agribusiness was also discussed.

Keywords: antimicrobial peptides, plant proteins, protein database, therapeutics, defensin

Introduction

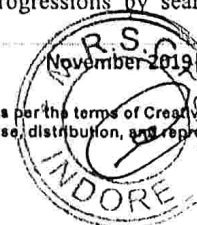
Antimicrobial peptides (AMPs) belong to a diverse group of bioactive molecules ranging from 10 to 100 amino acid residues in length [1]. Originally, these peptides were known to possess antagonistic action against numerous pathogens, including bacteria, fungi, viruses, protozoa. Recent discoveries have expanded their functions as immune modulators, antihypertensive molecules, anticancer, and antitumor agents [2,3]. Nowadays, AMPs are considered a fundamental component of the innate immune system [4]. These bioactive peptides have been naturally and synthetically derived from various prokaryotic and eukaryotic systems. Natural AMPs have been isolated from plants, amphibians, insects, mammals, fungi, bacteria, etc. [5,6]. Recent evidence of increasing resistance of microbes against antibiotics has drawn attention towards the use of peptides as novel therapeutics for the treatment of various Gram-positive and Gram-negative infections [7]. The use of AMPs in medicines has emerged rapidly because of their broad-spectrum activity and safety.

Additionally, pathogens are unlikely to develop resistance against these peptides as compared to antibiotics.

Plants produce defensive molecules in response to the invasion of pathogens. An array of peptides isolated from different parts of the plants, namely roots, seeds, flowers, stems, and leaves, has demonstrated antimicrobial activity against phytopathogens, as well as pathogenic bacteria causing infection in human beings [8]. Based on the amino acid sequence homology, the main families of plant AMPs comprise defensins, thionins, lipid-transfer proteins, cyclotides, snakins, and hevein-like proteins [9]. The key features defining plant AMPs are that they are enriched in cysteine and glycine and the presence of disulfide bridges [10]. The major challenges faced by these compounds are the development of intrinsic toxicity in plants, lesser stability, and cost of production, restricting their use for commercial applications. With the advancement in biotechnological techniques, these peptides can serve as an attractive tool in the agriculture field for increasing crop yields [11].

This article summarized different AMPs found in plants and updated the recent progressions by searching plant AMPs

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FINANCIAL STATEMENT ANALYSIS OF ONGC LTD: A DESCRIPTIVE STUDY

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**War Bilal Ahmed

Abstract

This write up is an attempt by the researchers to find out the effect of financial performance on the overall performance of the company. The researchers have used various parameters to measure and quantify the financial performance of the concern. It has been observed that sound financial performance results in sound functioning of the concern. The motive behind this research study is to provide various fruitful suggestions not for only the company under study but for all those companies comprising of similar kind of business.

Keywords: Financial Performance, Profitability, Solvency, EBIT

Introduction

Finance is important for every business organization whether the business is small, medium, or large. Without the adequate finance an enterprise cannot accomplish its objectives and cannot sustain in the market. There are two purposes for the business for which it needs finance, first one is the establishment of the business and second is to carry out its day to day operations. So we can say that the finance is the life blood of an enterprise and it is very necessary that an enterprise should perform very well financially. Financial Performance is the process of measuring the results of a firm's policies and operations in monetary terms. It is used to assess firm's overall financial health over a given period of time. It generally reflects the overall performance of the business as it tells us about the profitability, liquidity, feasibility, as well as the growth of the business. It is also used to indicate firm's success, state of affairs, and compliance. In order to find out the financial performance of an enterprise financial performance analysis is done, so that the relationship between the various items or components can be established and the firm's position and performance can be better recognized. It also identifies the financial strengths and weaknesses of the firm by properly establishing relationships between the items of the balance sheet and profit and loss account. If an enterprise is performing excellent it is beneficial not only for the enterprise but also for the Creditors, Investors, Management, and Bond Holders etc. Thus for the Feasibility, Viability, Capability, Diversification, Expansion, and growth of an enterprise, an enterprise should have a better financial performance.

Review of Literature

Sheela (2011), researcher has revealed the financial performance of Wheels India Ltd. through various financial tools namely ratio analysis, comparative balance sheet and DuPont analysis and also statistical tools such as trend analysis and correlation. The main contribution of this study is the use of five power analysis methodology to retrieve ratios commonly used in financial analysis to tackle the problem of sample size and distribution uncertainty.

Singh A. & Tandon P. (2012), in their paper they examined the financial performance of SBI and ICICI banks public sector and private sector respectively they compare the financial performance of SBI and ICICI banks on the basis of ratios such as credit deposit, net profit margin etc. The period of study taken is from the year 2007-08 to 2011-12. The study found that SBI is performing well and financially sound than ICICI Bank has better managing efficiency than SBI.

Roy M. & Sabah N. (2014), in their paper analyzed the performance of Oil and Natural Gas Corporation by using ratio analysis tool particularly those which are related to financial statement and find out the strength and weakness of the company and their position in the market for the balance of 2010-2013 are used.

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An overview on preparation and characterization of activated jetropha husk carbon

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Abstract

Activated carbon is amorphous carbon which exhibit high degree of micro porosity and large surface area. Jetropha Curcus is an important plant for the production of biodiesel. In the production of biodiesel huge volume of jetropha husk is generated which are consider as biodiesel waste. Jetropha husk is efficient raw material for the preparation of activated carbon. This paper reviews 103 research papers from 1991 to 2017 on study of characteristics of activated carbon prepared from Jetropha husk. Different researcher focus on physico-chemical characterization of activated jetropha husk carbon using XRD, SEM, FT-IR and TGA analysis. Physical properties such as ash content, moisture content, volatile matter content, surface area, CHNS analysis, pH and porosity were studied and analyzed in detail by different author.

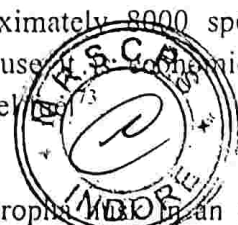
Keywords: Activated carbon jetropha husk (AJHC), biodiesel waste, chemical activation, characterization.

Introduction:

Activated carbon is a form of amorphous carbon with small, low volume pores that increase the surface area available for adsorption. Activated carbon is prepared by that organic substance which have high amount of carbon⁶⁷. Agricultural waste is one of the best choice because it contain high amount of carbon as well as its cost is low⁷⁰. Many researcher prepared activated carbon using various agricultural waste such as rice husk^{18, 19, 20, 21}, soybean hull²², maize cob^{23,24,25,26}, almond and apricot shell²⁷, cajanias Caján^{28,29,30}, sawdust^{31,32}, sugar-cane baggase^{33,34}, jetropha husk^{3,5,7}.

Jetropha Husk is poor in nutrients so that it cannot be used as agricultural fertilizers but it is rich in cellulose, hemicelluloses and lignin which is difficult to digest and degrade therefore converting this waste into valuable activated carbon is finest option².

Jatropha husk is the waste product of jatropha curcas plant which is a soft weeded deciduous shrub is also known as ratanjyot³⁵, jamalgota³⁵, chandrajyot³⁵, physic nut^{36,82} etc. It is a wildy growing hardy plant, in arid and semi-arid regions of the country on degraded soils having low fertility and moisture³⁵ and can live for about 50 years⁷¹. It is a tropical plant that can be grown in low to high rainfall areas either in the farms as a commercial crop or on the boundaries as a hedge to protect fields from grazing animals and to prevent and control erosion^{36, 72}. The crops of Jatropha curcus belongs to the family Euphorbianceae, which is comprised of approximately 8000 species belonging to 321 genera⁴. Now a days these crop is planted as commercial crop because it is chemically important in the production of oil which is an important replacement of petroleum based diesel.



Preparation of activated carbon is completed in two steps that is carbonization of raw jetropha husk in an inert atmosphere and than activation of the carbonized material either by physical activation or chemical activation



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A STUDY OF LEVEL OF PERCEPTION OF COLLEGEIAN STUDENTS TOWARDS DEMONETIZATION IN INDIA: WITH SPECIAL REFERENCE TO INDORE CITY

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Abstract

On 8th November 2016 night at 8.15 p.m. Prime Minister of India Mr. Narendra Modi in his unscheduled television address to the nation announced that the currency notes of ₹ 500 and ₹ 1000 denomination will not be a legal tender money from midnight. The reason for this move was: India's Ministry of Finance claimed that ₹ 500 and ₹ 1,000 notes are being used simply to finance terrorism, fund illegal drug sales, fuel the black market, drive counterfeiting and pay bribes. This so-called "black money" had reputedly built up to such epic proportions that Prime Minister Modi declared that enough was enough, that he would take it upon himself to wash his country's currency supply in one fell swoop.

This study will help us to know about the perception level of collegeian students from the different colleges of Indore city.

Keywords: Demonetization In India, Perception, Disadvantages and Study of Colleges.

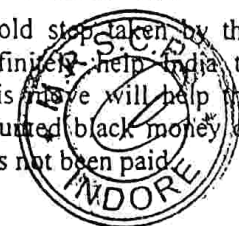
Introduction

On November 8, 2016, it was decided to demonetize high value currency notes of denomination of ₹ 1000 and ₹ 500 (called specified bank notes - SBNs). Such notes, valued at ₹ 15.4 trillion, constituted 86.9 per cent of the value of total currency in circulation. The decision was in continuation of a series of measures taken by the Government of India during last two years aimed at eliminating corruption, black money, counterfeit currency and terror funding. The decision was guided by the aim of reaping its enormous potential medium-term benefits in the form of reduced corruption, greater digitization of the economy, increased flow of financial savings and greater formalization of the economy. All of these would lead to higher GDP growth and tax revenues that could be used by the Government for inclusive and stronger economic growth within the norms of

fiscal prudence, besides contributing to overall improvement in business environment.

India has traditionally been a cash intensive economy. According to an estimate, about 78 per cent of all consumer payments in India are affected in cash. It was, therefore, obvious that currency squeeze during the demonetization period would have had some adverse impact on economic activity, although such impact was expected to be transient. In order to mitigate the adverse impact on the common man as also on economic activity, a series of measures were undertaken, keeping in view the feedback received from various quarters showed in below table.

It is no doubt a bold step taken by the government which will definitely help India to become corruption-free. This move will help the government to track unaccounted black money or cash on which income tax has not been paid.



Pectinolytic enzymes-solid state fermentation, assay methods and applications in fruit juice industries: a review

Mukesh Kumar Patidar¹ · Sadhana Nighojkar² · Anil Kumar³ · Anand Nighojkar¹ 

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Abstract

A plethora of solid substrates, cultivation conditions and enzyme assay methods have been used for efficient production and estimation of polygalacturonase and pectin methylesterase enzymes. Recent developments in industrial biotechnology offer several opportunities for the utilization of low cost agro-industrial waste in Solid State Fermentation (SSF) for the pectinolytic enzyme production using fungi. Fruit waste mainly citrus fruit waste alone and along with other agro-industrial waste has been explored in SSF for enzyme production. Agro-industrial waste, due to the economic advantage of low procuring cost has been employed in SSF bioreactors for pectinolytic enzyme production. Acidic pectinases produced by fungi are utilized especially in food industries for clarification of fruit juices. This review focuses on the recent developments in SSF processes utilizing agro-industrial residues for polygalacturonase and pectin methylesterase production, their various assay methods and applications in fruit juice industries.

Keywords Agro-industrial waste · Enzyme assay · Juice clarification · Pectinolytic enzymes · Solid state fermentation

Introduction

Pectinolytic enzymes are a group of related enzymes that hydrolyse pectic substances. Pectin is a complex polysaccharide present in the middle lamella of plant cell walls. It is composed of multiple units of D-Galacturonic acid linked by α (1, 4) glycosidic linkage. Pectinolytic enzymes have been reported in higher plants (Nighojkar et al. 1994; Jolie et al. 2010) and microorganisms including bacteria and fungi (Uzuner and Cekmecelioglu 2015; Patidar et al. 2016; Rebello et al. 2017). Pectin is completely digested by three major enzymes: pectin methylesterase (pectinesterase; EC: 3.1.1.11), pectinase (polygalacturonase; EC: 3.1.1.15) and pectin lyase (EC: 4.2.2.10) to release galacturonic acids and its oligomers (Combo et al. 2012). In nature, microorganisms have been endowed with vast potential. They produce a

range of enzymes, which have been exploited commercially over the years. It has been reported that microbial enzymes account for 25% of total global enzyme sales (Jayani et al. 2005). The pectic substances can be converted by means of microorganisms or their enzymes into constituent monosaccharides or specific oligosaccharides without the production of undesirable by-products (Zykwinska et al. 2008; Martínez et al. 2009).

Pectinases are known for their tremendous potential in various industries. Pectin methylesterase and endo-polygalacturonase have important role in softening of fruits, extraction and clarification of juices, preparing gel, food manufacturing, retting of textile fibers, extraction of olive oil, protoplast isolation, etc. (Kashyap et al. 2001; Jayani et al. 2005; Kohli and Gupta 2015). Galacturonic acid, produced by action of pectinolytic enzymes, has various applications in industries mainly in pharmaceutical industries. It is used for the production of vitamin C as a chelating agent in food industries and as washing powder agent in chemical industries (Molnar et al. 2009; Burana-Osot et al. 2010). Almost all the commercial preparations of pectinases are produced from fungal sources (Kertesz 1951). Filamentous fungi especially *Aspergillus niger* is the major producer of acidic pectinase used mainly in fruit juice and wine industries (Kashyap et al. 2001).

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जितेन्द्र श्रीवास्तव के काव्य का भाषायी सौन्दर्य

भोजराज बारस्कर (शोधार्थी)

भाषा अध्ययन शाला

देवी अहिल्या विश्वविद्यालय

डॉ. पुष्पेन्द्र दुबे (निर्देशक)

महाराजा रणजीत सिंह कॉलेज ऑफ प्रोफेशनल साइंसेस

इन्दौर, मध्यप्रदेश, भारत

शोध संक्षेप

काव्य में कवि या रचनाकार मनोभावों को कलात्मक रूप से भाषा के द्वारा अभिव्यक्त करता है। भाषा कवि की अनुभूतियों को आकार देने का माध्यम बनती है जिससे कवि की अनुभूतियाँ सार्वजनिक हो जाती हैं। काव्य मनुष्य को संकुचित दायरे से ऊपर उठाता है, तो सृष्टि से रागात्मक सम्बन्ध भी स्थापित करता है। भाषा सांस्कृतिक परम्पराओं की वाहक होती है। काव्य-भाषा के माध्यम से कवि प्रकृति, मनुष्य व समाज से संबंधित विविध पक्षों को जीवन्तता के साथ प्रस्तुत करता है। कवि अपने मनोभावों को भाषिक कौशल से व्यक्त कर काव्य में रोचकता, सरसता, प्रभावपूर्णता व मधुरता का संचार करता है साथ ही काव्य के सौन्दर्य में भी वृद्धि करता है। इक्कीसवीं सदी के प्रमुख कवि जितेन्द्र श्रीवास्तव की कविताओं में भाषा के विविध रूप अभिव्यक्त हुए हैं प्रस्तुत शोध पत्र में उनके काव्य में भाषायी सौन्दर्य पर विचार किया गया है।

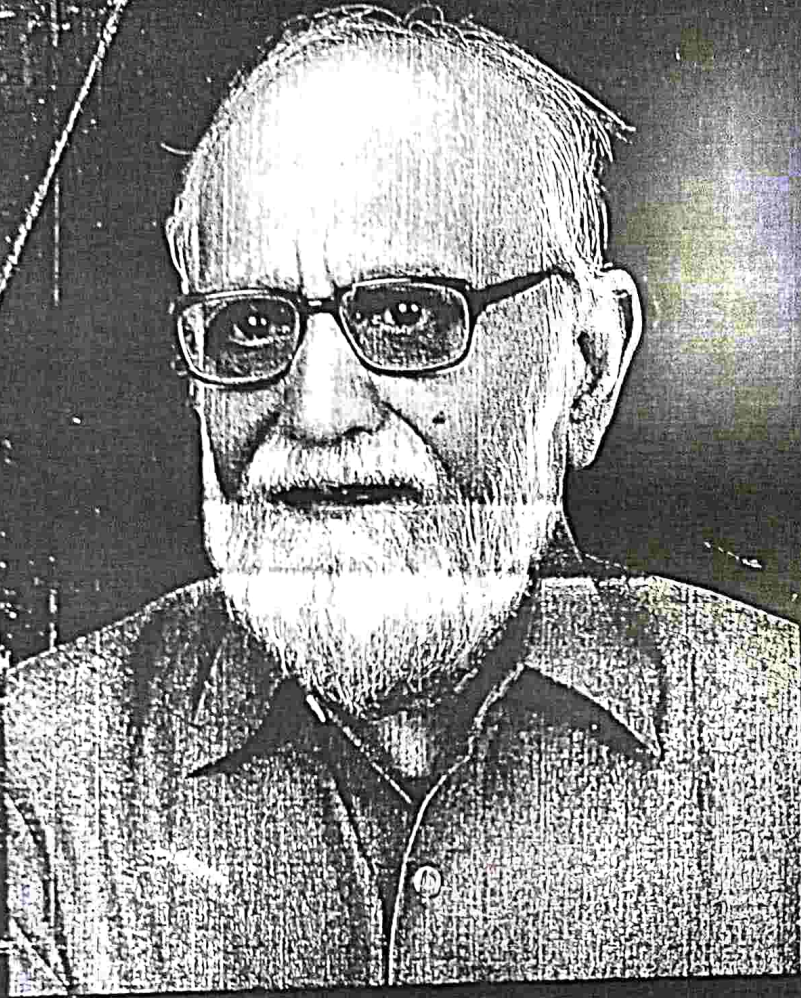
प्रस्तावना

कविता और समाज का सम्बन्ध अनंत काल से घनिष्ट रहा है। बदलते परिवेश के साथ कविता की शिल्प-शैली में बदलाव आया है। कवि की अपनी भाषा होती है। अपने आस-पास के परिवेश में रहकर कवि भाषा को ग्रहण करता है जो काव्य रचना में पल्लवित होती है। काव्य में कला पक्ष के अन्तर्गत कविता को मर्मस्पर्शी बनाने में सार्थक ध्वनि समूह का महत्वपूर्ण योगदान होता है। आज कविता छन्दमुक्त होती जा रही है, जिसमें न गीतात्मकता है और न संगीतात्मकता, न लय है, न तुक, न यति है और न ही गति। कवि अपने स्वच्छंद भावों की अभिव्यक्ति स्वतंत्र रूप से कर रहा है। जितेन्द्र

श्रीवास्तव की अधिकांश कविताएं छंदमुक्त होने के बावजूद पाठक को प्रभावित करने में समर्थ हैं जो संवादात्मक शैली में लिखी हैं।

आज हम ज्ञान-विज्ञान के क्षेत्र में अनेक उपलब्धियों एवं प्रभावशाली घटनाओं का परिवर्तित रूप देख रहे हैं। इस परिवर्तन ने सर्जन को रचना की नई एवं जटिल अभिव्यक्ति दी। रचनाकार के सामने जब संप्रेषण की समस्या उपस्थित हुई तब प्रयोगवाद और नईकविता का उद्भव हुआ। शिल्प के संबंध में डॉ. नगेन्द्र का कथन है, "शिल्प शब्द का अर्थ है शिल्प-समीक्षा के प्रायः तब से हुआ है जब शिल्पित कलाओं के अन्तःसम्बन्ध तथा परस्परिक अंतःनिवेश की सैद्धान्तिक एवं व्यावहारिक स्तर

वाजेद्व मिश्र भूतन अंक



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राजेंद्र मिश्र के तीन उपन्यास

'जिंदगी की सरहद', 'पाँचवाँ स्तंभ' और 'ल्लासा का चाँद' की समीक्षा

डॉ० पुष्पेंद्र दुबे

इंगी की सरहद' : जीवन की सार्थकता की खोज

आज के उपन्यासकारों में राजेंद्र मिश्र के उपन्यास मौल्य का पथर हैं। उनकी रचनावली के खंड में उपन्यास है 'जिंदगी की सरहद'। उपन्यास का ताना-बाना मानवीय रिश्तों को लेकर मनोवैज्ञानिक उलझनों और वैरिवक स्तर पर घटित होनेवाली घटनाओं को लेकर बना गया उपन्यास का कैनवास विशाल है, परंतु कथावस्तु में विशालता नहीं है। कथा अनेक स्तरों पर है। स्त्री-पुरुष-संबंध, विवाह-संस्था की अप्रासंगिकता, अंतरादेशीय विवाह और उससे न समस्या, स्त्री पर पुरुषों का वर्चस्व, हिंदू-मुस्लिम समस्या, धर्मनिरपेक्षता, शहरों का लण, मंदिर-मस्जिद, राजनीतिक पाखंड, सरकार द्वारा सीबीआई-का-दुरुपयोग, आन्तरिक संघर्ष हेतुल नजरिया, देशों की ध्वस्त होती अर्थव्यवस्था आदि को मिश्रजी ने अपने उपन्यास के नक में शामिल किया है। इसका विस्तार भारत से लेकर अमेरिका, रूस, पाकिस्तान, बॉस्निया, गिनी और यूरोपीय देशों तक किया गया है। स्त्री-पुरुष संबंधों को लेकर समाज की अनेक गूँद रही हैं। उत्तर-आधुनिकता की अंधी दौड़ में विवाह-संस्था पर प्रश्नचिह्न लग गया है। तब विचारधारा विवाह जैसी संस्था को अनावश्यक मान रही है। आदिम युग की सभ्यता को न में लाने की चेष्टा बलवती हो रही है। उनके उपन्यासों में भारतीय चिंताओं को वैरिवक क्ष में अभिव्यक्ति मिलती है। भारत की विविधता को देखते हुए यदि इसे एक अंतराष्ट्रीय देश तो अतिशयोक्ति नहीं होगी। जो आशाएँ, आकांक्षाएँ और समस्याएँ भारत के हृदय और एक को मथ रही हैं, उनसे विश्व भी अछूता नहीं है। सर्वत्र मिश्र ने 'जिंदगी की सरहद' में जिन क समस्याओं पर चिंतन प्रस्तुत किया है, वह भारत के आमजन के मन की अभिव्यक्ति है। स्त्री-पुरुष-संबंधों के मनोविज्ञान को भी उन्होंने बखूबी उभारा है। आज उपन्यास की सीमाएँ एक देश तक सीमित न होकर विश्व-दिगत तक फैल गई हैं। अब यह सिर्फ किसी एक देश गामाजिक, आर्थिक, राजनीतिक, सामाजिक, ऐतिहासिक परिस्थितियों तक सीमित नहीं रह है। आदर्शवादी चोला को इसने कब का फेंक फेंका है। मनुष्य जैसा है, उसे वैसी ही अभिव्यक्ति का चलन बढ़ गया है। देश के भीतर के भीतर में आज का मनुष्य विशिष्ट प्रकार की त्रासदी से रहा है। उसने सुख, दुःख, भय, आशा, समाज-निर्माण के स्वप्न सजोये हैं, परंतु अंधेरे में रहा है। उनके उपन्यासों में समाज-कथानक और पात्र इसी दुनिया के बहुत-सामान्यजन हैं। विशिष्ट होने की चाह अवश्य है।

जिंदगी के 'जिंदगी की सरहद' उपन्यास का पात्र मलय एक विशेष प्रकार की राष्ट्रवादी और ज्वलंत से सजुत है। उसका सारा चिंतन आत्मकेंद्रित है। वह हिंदुत्व के घेरे में कैद है।

पक्ष में नजर आती है। यहाँ तक कि वह पड़ोसी देश पाकिस्तान में हिंदुओं पर होनेवाले अत्याचारों को देख-सुनकर विचलित हो जाता है। एक ओर तो वह इसानियत को सबसे ऊपर रखता है, वहीं दूसरी ओर वह अपने विचारों की व्याख्या धर्म-विशेष के परिप्रेक्ष्य में करता है। उपन्यास में मलय के रूप में स्वयं लेखक ही उपस्थित है। मलय गुप्त रूप से वैरिवक केंद्र का संचालन करता है। वकीलीकस की तर्ज पर उसने अपना इन्वेस्टिगेशन कैम्पस सरकार की नजरों से दूर बनाया है। उसमें चुनी हुई विचारधारा के लोग ही आ सकते हैं। इस केंद्र में पहले प्रतिदिन और बाद में साप्ताहिक बहसों का आयोजन होता है, जिसमें दुनियाभर के विचारक भाग लेते हैं। वह यूरोजोन की समस्या हो या पाकिस्तान-बांग्लादेश में हिंदुओं पर होनेवाले अत्याचार की समस्या हो, भारत में बहुसंख्यकों का प्रश्न हो या अयोध्या में मंदिर निर्माण से जुड़ा मुद्दा हो, सभी पर मलय सबसे अंत में विचार व्यक्त करता है और उसे बहस में शामिल समस्त बुद्धिजीवी बिना कोई प्रश्न किए स्वीकार कर लेते हैं। अल्पसंख्यकों की बढ़ती आबादी से वह भारत सहित दुनियाभर के देशों को भयभीत बनाने में कोई कसर नहीं छोड़ता। उपन्यास में मलय आर.एस.एस. के विचारों का वाहक है। जिस प्रकार हिंदी साहित्य में कभी मार्क्सवादी विचारधारा को प्रगतिवाद के नाम से प्रवाहित किया गया था, उसी प्रकार उपन्यास में दक्षिणपंथी विचारधारा को अनेक तर्कों से पुष्ट करने का प्रयास किया गया है। उपन्यास के प्रारंभ में ही यह बता दिया गया है कि मलय अपना कामकाज गुप्त तरीके से संचालित करता है। उसकी इन्वेस्टिगेशन एजेंसी के बारे में किसी को अधिक जानकारी नहीं है। बाद में वह टेलिविजन की दुनिया में कदम रखता है। उपन्यास पढ़ते हुए ऐसा लगता है कि लेखक एक वैचारिक वाद को तथ्यों और तर्कों से स्थापित करना चाहता है। मलय द्वारा स्थापित विश्व संचार केंद्र पर होनेवाले बहसों प्रयोजित लगती हैं। ऐसी बहस लेखकीय वक्तव्य के अधिक निकट है। मलय अपने ही द्वारा बुलाई गई मीडिया से ऊबने लगता है। वह सोचता है कि इन मीडिया से कुछ निकलता नहीं है। मलय को यह भी लगता है कि यदि 1916 में मुस्लिमों को राजनीति में आरक्षण दे दिया जाता तो विभाजन की त्रासदी नहीं झेलनी पड़ती। आज नौकरियों और संवैधानिक संस्थाओं में मुस्लिमों को आरक्षण दिया जा रहा है, तब ऐसा लगता है वह दिन दूर नहीं जब पार्लियामेंट के लिए मुस्लिमों को ओबीसी-क्वोट दिया जाएगा। धार्मिक आधार पर भी आरक्षण को शुरूआत होगी। भारत ने बांग्लादेश को अजिब करवा, लेकिन वहाँ के लोगों ने आसाम और पश्चिम बंगाल के लिए समस्या खड़ी कर दी है। आजादी के बाद से देश में ज्यादातर समय काँग्रेसी सरकार रही। मलय वर्तमान में उपस्थित समस्याओं के लिए सरकार की रीतियों-नीतियों को जिम्मेदार मानता है। मलय को केंद्र सरकार पर बिलकुल भी भरोसा नहीं है। केंद्र सरकार विदेशों में रहनेवाले हिंदुओं के बारे में कोई विचार नहीं करती। वे केवल मुस्लिम वोट बैंक को सँभालने का काम कर रहे हैं। बांग्लादेश से आनेवाले लोगों को आधार कार्ड भी जारी हो गए हैं। उन्होंने यहाँ आकर पार्टी भी बना ली है। मलय को भारत के मीडिया पर भी विश्वास नहीं है। वह मानता है कि यहाँ का मीडिया प्रो-मुस्लिम है। वह अपने आपसे ही प्रश्न करता है कि जब गोधरा में हिंदू मारे गए, तब मीडिया को दिखाई नहीं दिया, लेकिन उसके बाद हुए दंगों को वह बार-बार याद करता है। यही धर्मनिरपेक्षता है क्या? मीडिया के दौरान मध्य स्त्री-पुरुष विचारधारा के घेरे में कैद है।

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Approach towards different fermentative techniques for the production of bioactive actinobacterial melanin

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ABSTRACT

Actinobacteria were isolated from soil samples gathered from different localities of Indore region. Among 64 isolates, 28 exhibited pigment production. These isolates were further assessed in secondary screening by submerged fermentation process. The isolate NL was found to be the highest pigment producer. Cultural and Morphological characteristics of our isolate NL corresponded with typical features of Streptomyces. Maximum pigment production was observed on peptone yeast extract iron medium (PYI). Pigment yield was highest using cotton method when compared against solid state and submerged fermentation processes. The influence of heavy metal salts on pigment production was tested and results revealed that Co, Cu and Pb increased the pigment production whereas Mn was found to have inverse effect. Antibacterial activity of crude melanin obtained from different fermentative processes was checked against test organisms *Escherichia coli*, *Salmonella typhi*, *Bacillus subtilis* and *Staphylococcus aureus*. The crude melanin recovered from cotton method and submerged fermentation exhibited broad spectrum activity against gram positive and gram negative organism. Optimised pigment production using the enhancing heavy metals can be scaled up to industrial level for production of pigments to be employed as preservatives and dyes.

1. Introduction

Actinobacteria are ubiquitous gram positive bacteria exhibiting filamentous growth and are abundantly present in soil (Lakshminarayana and Krishnan, 2010; Popa and Bahrain, 2011). They are biotechnologically valuable class of prokaryotes and have significant importance in recycling of organic matter and xenobiotic compounds. This activity is associated with the production of different hydrolytic exo-enzymes (Srinivasan et al., 1991; Ballav et al., 2012; Barka et al., 2016). Among actinobacteria, *Streptomyces* is one of the largest and widely studied genera (Sivaperumal et al., 2014). Their large genome makes them a prolific source of secondary metabolites like antibiotics, enzymes, antitumor, striking pigments and pesticides (Kafilzadeh and Dehdari, 2015).

Production of pigment from microorganisms is independent of weather conditions. Other alternatives of pigment source include plants which are highly influenced by climatic conditions whereas microbial growth can be conveniently controlled by regulating the physiological and nutritive conditions. Production of pigments from microbial sources is therefore advantageous over plant based pig-

ments (Venil and Lakshmanaperumalsamy, 2009). The characteristic of pigment production is widespread among the members of actinobacteria than in any other bacteria (Sánchez-Marroquín and Zapata, 1954). The dark-brown to black pigments synthesized by microorganisms are considered melanins which are formed by the oxidative polymerization of indolic or phenolic compounds (Manivasagan et al., 2013b). Melanins are amorphous, negatively charged, high molecular weight polymers which have significant contribution in improving the growth and survival mechanism of organisms. These compounds are known to protect organisms against environmental stress, temperature extremes and UV radiations (Manivasagan et al., 2013a; Sivaperumal et al., 2014). Melanins have widespread applications in pharmacology, cosmetics, textile, agricultural and food industries (Dastager et al., 2006).

The objective of the present investigation is to isolate potential pigment producing soil actinobacteria and implementation of different fermentative processes for better yield of pigment. The antimicrobial potential of the pigment was also explored and the potential actinobacterial strain was characterised on the basis of cultural and morphological features.

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Preservers of Gershgorin Set of Jordan Product of Matrices

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ABSTRACT. For $A, B \in M_2(\mathbb{C})$, let the Jordan product be $AB + BA$ and $G(A)$ the eigenvalue inclusion set, the Gershgorin set of A . Characterization is obtained for maps $\phi: M_2(\mathbb{C}) \rightarrow M_2(\mathbb{C})$ satisfying

$$G[\phi(A)\phi(B) + \phi(B)\phi(A)] = G(AB + BA)$$

for all matrices A and B . In fact, it is shown that such a map has the form $\phi(A) = \pm(PD)A(PD)^{-1}$, where P is a permutation matrix and D is a unitary diagonal matrix in $M_2(\mathbb{C})$.

1. Introduction

Eigenvalues of matrices play central role in linear algebra and its applications. When the order of the matrix is high, there is no efficient way to compute eigenvalues unless the matrix is of very special type. At times knowing the location of eigenvalues will be sufficient. Hence eigenvalue inclusion sets (i.e. sets containing eigenvalues) are of interest to the researchers.

The important types of eigenvalue inclusion sets of matrix A are Gershgorin set

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Key words and phrases : Eigenvalue, Inclusion sets, Jordan Product, Preservers, Gershgorin Set.

Comment on the paper "Preserves of eigenvalue inclusion sets of matrix products"

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Abstract

In [3], Theorem 2.1 deals with characterization of mappings $\phi: M_n \rightarrow M_n$ which satisfies $O_\varepsilon(\phi(A)\phi(B)) = O_\varepsilon(AB)$, where $O_\varepsilon(A)$, $\varepsilon \in [0,1]$, denotes Ostrowski set of A . In the proof of this theorem an assertion was made (assertion 2.6) whose proof contains an error. In this paper an example is provided to substantiate our claim and the error also has been rectified.

Keywords: Eigen value, Inclusion sets, Preservers, Gershgorin Set, Ostrowski set.

Introduction

First we introduce the notations used in the paper.

Let M_n be the set of $n \times n$ complex matrices and $E_{11}, E_{12}, \dots, E_{nn}$ be the standard basis of M_n . For any matrix $A \in M_n$, Eigen values inclusion set is a set which includes all its eigenvalues.

There are three main Eigen values inclusion sets of any matrix $A \in M_n$, namely Gershgorin set, Ostrowski set and Brauer's set which are denoted by $G(A)$, $O_\varepsilon(A)$ and $C(A)$ respectively (For definitions of $G(A)$, and $O_\varepsilon(A)$ see section 1). It is known that $O_1(A) = G(A)$.

In [3, Theorem 2.1], it has been proved that, a mapping $\phi: M_n \rightarrow M_n$ satisfies $O_\varepsilon(\phi(A)\phi(B)) = O_\varepsilon(AB)$ for all $A, B \in M_n$, $\varepsilon \in [0,1]$ if and only if there exist $c = \pm 1$, a permutation matrix P and an invertible diagonal matrix D , where D is unitary matrix unless $(n, \varepsilon) = (2, \frac{1}{2})$, such that $\phi(A) = c(DP)A(DP)^{-1}$.

While Assertions 2.1 to 2.3 prove the theorem for $\varepsilon = 1$ i.e. when ϕ satisfies $G(\phi(A)\phi(B)) = G(AB)$ for all $A, B \in M_n$. Assertions 2.4 to 2.6 prove the theorem for $\varepsilon \in (0,1)$. Essentially proof of assertion (2.6) is the proof of the theorem for $\varepsilon \in (0,1)$.

The matrices X and Y considered in 2.6 do not satisfy $O_{\frac{1}{2}}(A) = O_{\frac{1}{2}}(B)$ as claimed which is crucial for the proof of the assertion. A counter example has been provided in this note to this effect. Further, X and Y have been defined so that

$O_{\frac{1}{2}}(A) = O_{\frac{1}{2}}(B)$ and the rest of the proof goes through.

This paper has been divided into 2 sections.

Section 1 deals with basic definitions, statements of key results from [3] and Section 2 with counter example to show that the claim made in Assertion 2.6 is false and rectification of proof of the assertion.

Section 1: Basic Definitions and Statements

Given matrix $A = [a_{ij}] \in M_n$, we define

$$R_k(A) = \text{Row deleted sum of } A = \sum_{j \neq k, j=1}^n |a_{kj}|$$

$$C_k(A) = \text{Column deleted sum of } A = \sum_{i \neq k, i=1}^n |a_{ik}|$$

The Gershgorin set of A (see [1], [2]) is defined as

$$G(A) = \bigcup_{k=1}^n G_k(A), \text{ where } G_k(A) = \{\mu \in \mathbb{C}; |\mu - a_{kk}| \leq R_k(A)\}$$

It is well known that $G(A)$ contains all the Eigen values of A .

Let $\varepsilon \in [0,1]$ the Ostrowski set of A (see [1]) is defined by





Pectinolytic enzymes-solid state fermentation, assay methods and applications in fruit juice industries: a review

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Abstract

A plethora of solid substrates, cultivation conditions and enzyme assay methods have been used for efficient production and estimation of polygalacturonase and pectin methylesterase enzymes. Recent developments in industrial biotechnology offer several opportunities for the utilization of low cost agro-industrial waste in Solid State Fermentation (SSF) for the pectinolytic enzyme production using fungi. Fruit waste mainly citrus fruit waste alone and along with other agro-industrial waste has been explored in SSF for enzyme production. Agro-industrial waste, due to the economic advantage of low procuring cost has been employed in SSF bioreactors for pectinolytic enzyme production. Acidic pectinases produced by fungi are utilized especially in food industries for clarification of fruit juices. This review focuses on the recent developments in SSF processes utilizing agro-industrial residues for polygalacturonase and pectin methylesterase production, their various assay methods and applications in fruit juice industries.

Keywords Agro-industrial waste · Enzyme assay · Juice clarification · Pectinolytic enzymes · Solid state fermentation

Introduction

Pectinolytic enzymes are a group of related enzymes that hydrolyse pectic substances. Pectin is a complex polysaccharide present in the middle lamella of plant cell walls. It is composed of multiple units of D-Galacturonic acid linked by α (1, 4) glycosidic linkage. Pectinolytic enzymes have been reported in higher plants (Nighojkar et al. 1994; Jolie et al. 2010) and microorganisms including bacteria and fungi (Uzuner and Cekmecelioglu 2015; Patidar et al. 2016; Rebello et al. 2017). Pectin is completely digested by three major enzymes: pectin methylesterase (pectinesterase; EC: 3.1.1.11), pectinase (polygalacturonase; EC: 3.1.1.15) and pectin lyase (EC: 4.2.2.10) to release galacturonic acids and its oligomers (Combo et al. 2012). In nature, microorganisms have been endowed with vast potential. They produce a

range of enzymes, which have been exploited commercially over the years. It has been reported that microbial enzymes account for 25% of total global enzyme sales (Jayani et al. 2005). The pectic substances can be converted by means of microorganisms or their enzymes into constituent monosaccharides or specific oligosaccharides without the production of undesirable by-products (Zykwiniska et al. 2008; Martínez et al. 2009).

Pectinases are known for their tremendous potential in various industries. Pectin methylesterase and endo-polygalacturonase have important role in softening of fruits, extraction and clarification of juices, preparing gel, food manufacturing, retting of textile fibers, extraction of olive oil, protoplast isolation, etc. (Kashyap et al. 2001; Jayani et al. 2005; Kohli and Gupta 2015). Galacturonic acid, produced by action of pectinolytic enzymes, has various applications in industries mainly in pharmaceutical industries. It is used for the production of vitamin C as acid agent in food industries and as washing powder agent in chemical industries (Molnar et al. 2009; Burana-Osot et al. 2010). Almost all the commercial preparations of pectinases are produced from fungal sources (Kertesz 1951). Filamentous fungi especially *Aspergillus niger* is the major producer of acidic pectinase used mainly in fruit juice and wine industries (Kashyap et al. 2001).

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A Look Ahead Load Shed Strategy for Line Overload Alleviation Based on the Sensitivity of a Severity Index Incorporating Distributed Generations

Pradeep Purey*

The paper describes a new methodology for load shed at buses incorporating the effect of Distributed Generation (DG) at selected buses. The strategy gives load shed amount at selected buses in anticipation of the predicted load in the next interval. The method first exploits the capability of DG present at various buses for achieving line overload alleviation and then, if necessary, load shed is executed at load buses. It is a monovaryable method, where load shed is executed at buses having the highest sensitivity of Severity Index (SI), and then another bus is selected in the next iteration based on the magnitude of sensitivities. The algorithm has been implemented on a 30-bus test system.

Keywords: Load shed, Severity Index (SI), Jacobian, Sensitivity, Line overload alleviation, Distributed Generation (DG)

Introduction

Various security levels based on the operating conditions of a power system were defined by Stott *et al.* (1987). 'Secure' and 'correctively secure' status provide safe operating conditions. Disturbances in the system, e.g., component outages, load increase will bring in the system various unsecure operating conditions. These unsecure emergency states are alert, correctable emergency and non-correctable emergency. Violations of operating constraints, e.g., bus voltage magnitudes, line flows and voltage stability margin are alleviated by rescheduling usual real and reactive power control variables if the system operates in alert and correctable state. Unusual control action as line switching is executed for alleviation of line overloads or rotation of overload at times if system capability permits (Arya *et al.*, 2000). If the system lends up in non-correctable emergency state, then load shedding is the only remedy to make the operation of system secure. At times, at selected buses, Distributed Generation (DG) is available in standby mode which may be strategically brought into the picture for alleviating operating limit violations (Bae *et al.*, 2004; Arya *et al.*, 2012a; and Arya, 2014). Hence the option of DG should be taken into consideration

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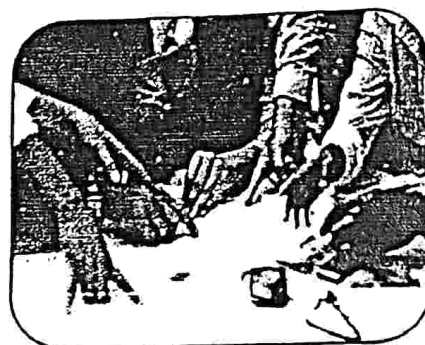


EMOTIONAL INTELLIGENCE: A PREDICTOR FOR MANAGERIAL EFFECTIVENESS IN EMPLOYEES STATE INSURANCE CORPORATION {ESIC}

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ABSTRACT

With the advent of the 21st century, the role of Employees State Insurance Corporation is important to provide their services in the perspective of managerial effectiveness. In this study, the researcher has attempted to examine the impact of managerial effectiveness on Employees State Insurance Corporation employees. This sector is very vital to protect the employees and very much conscious about their social security. An amplified reliance on computerized technology, tele-working, self-regulated work and team work; all these changes move towards a more flexible and elastic personnel management, both in number of increasing human power and in their skills and competencies. The adjustments with the changing conditions of work and employment are responded by significantly. With the growth of information technology, leaner & flexible processes have increased the demand for competent managers for handling the multi-task. For this study total 100 employees of Employees State Insurance Corporation were selected to examine the impact of managerial effectiveness.

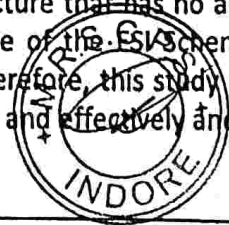


KEYWORDS: emotional intelligence managerial effectiveness, work and employment, competency, self-regulated work.

INTRODUCTION

India's population although their capacities to pay insurance premiums are very low mainly consisting of middle and low-income segment requires the stipulation of social security. In India, only 3% of population is covered by some type of health insurance, either social or private due to unawareness of the schemes of ESIC. The existing mandatory health insurance scheme in India for Organized Sector is – Employees' State Insurance Scheme (ESIS) and Central Government Health Scheme (CGHS). The Employees' State Insurance (ESI) Scheme is more appropriate and significant because this was the first social insurance measures introduced in India.

The first social insurance measures introduced in India was the Employees' State Insurance (ESI) Scheme which is more relevant and implemented and administered through Employees State Insurance Corporation (ESIC). Over the last six decades ESI Scheme of India is a major multi-dimensional social indemnity and medical care programmer that has emerged with its exceptional growth in lieu of geographical & demographic coverage, multi-faceted services and an infrastructure that has no analogous. Despite all the efforts made by the Corporation for the efficient performance of the ESI Scheme in the country, public perspicacity of the Corporation has not been very positive. Therefore, this study examines the impact of emotional intelligence in handling the managerial tasks efficiently and effectively and insured persons for the delivery of services by Employees State Insurance Corporation.



Purification and Characterization of Polygalacturonase Produced by *Aspergillus niger* AN07 in Solid State Fermentation

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Abstract

Polygalacturonase, an industrial enzyme has been produced from various fungal isolates using solid state and submerged fermentation techniques. The challenge has been yield, extraction and cost of production. In the present study, a low cost solid substrate, dried papaya peel was employed for polygalacturonase production using *Aspergillus niger* AN07. Polygalacturonase enzyme from *Aspergillus niger* AN07 was purified to 24.8 fold with a 52.6% recovery through anion exchange chromatography on DEAE-cellulose and gel filtration chromatography using Sephadex G-200. The SDS-PAGE revealed that the enzyme was monomeric with a molecular weight of 64.5 kDa. The optimum pH and temperature were 5.0 and 55°C, respectively. This enzyme was stable over a wide pH range (4.0–7.0) and relatively high temperature of 55°C for 1 h. The *K_m* and *V_{max}* values of polygalacturonase for polygalacturonic acid were 2.6 mg/l and 181.8 µmol/ml/min, respectively. The purified enzyme could digest the polygalacturonic acid into oligosaccharides with a small amount of galacturonic acid as visualized on thin layer chromatography.

Keywords: Polygalacturonase, Purification, Characterization, DEAE-cellulose chromatography, Sephadex G-200 chromatography

Introduction

Pectin, a major constituent of plant cell wall is mainly composed of galacturonic acid residues. The enzymes that hydrolyze pectic substances are broadly known as pectinolytic enzymes, which include pectin methylesterase, polygalacturonase (exo-polygalacturonase and endo-polygalacturonase) and pectin lyase on the basis of their mode of action [1, 2]. Polygalacturonase is one of the most widely distributed enzymes in bacteria [3], fungi [4] and plants [5]. Polygalacturonase (pectinase; EC. 3.2.1.15) hydrolyzes the α-1, 4-glycosidic bond between galacturonic acid residues and releases oligomers of D-galacturonic acid.

Polygalacturonase has a share of 25% in the global sales of food enzymes and has numerous biotechnological applications such as in fruit juice extraction and its clarification, scouring of cotton, degumming of plant fibers, waste water treatment, vegetable oil extraction, tea and coffee fermentation, bleaching of paper, in poultry feed as additive and in alcoholic beverages [6-9].

Polygalacturonase has been purified and characterized from various fungal isolates viz. *Mucor flavus* [2], *M. circinelloides* [10], *A. niger* [11-13], *A. awamori* [14, 15], *A. carbonarius* [16], *Rhizopus oryzae*

[17], *Sclerotium rolfsii* [18], *Penicillium sp.* [19, 20], *Bispora sp.* [21] and *Neosartorya fischeri* [22].

Polygalacturonase production from microorganisms has been reported under both submerged (SmF) and solid-state fermentation (SSF) conditions [23]. SSF holds tremendous potential for the production of industrial enzymes. Agro-industrial residues are generally considered as suitable substrates for the production of enzymes in SSF [24-26].

In the present study, polygalacturonase produced by locally isolated *A. niger* AN07 in SSF has been purified using ammonium sulfate precipitation, ion exchange and gel filtration chromatographies. The purified enzyme has been characterized for its physico-chemical properties.

Materials and Methods

Materials

Pectin, polygalacturonic acid and D-galacturonic acid were purchased from Sigma-Aldrich Chemical Co., USA. Microbial substrates, papaya peel and orange peel were collected from local juice shops and dried before use. Other chemicals used in the study were of analytical grade.

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Environmentally positive and energy proficient synthesis of coumarin by the Pechmann reaction via microwave irradiation

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Coumarins have been synthesized by microwave irradiation in solvent free reaction condition, and excellent yields of coumarins have been obtained with high purity. Pechmann method is a reverse reaction which is one of the easy and forthright scheme used to produce coumarins. IR and NMR spectroscopy have been used to confirm the successful synthesis of coumarins by Pechmann reaction. Use of commercially accessible low-cost catalyst makes this procedure very fascinating from a cost-effective point of view. An easygoing and capable microwave synthesis technique has been evolved for condensation of β -ketoester and substituted phenol in the presence of catalytic quantity of oxalic acid at extensive temperature range to give the resultant substituted 4-methyl-2H-chromen-2-one in elevated output.

Keywords: β -Ketoester, Microwave irradiation, Oxalic acid, Pechmann condensation, Substituted phenols

Coumarins are placed under the class benzopyrones of heterocyclic compounds having physiological and pharmacological activities. They are widespread in plants, they are also isolated from tonka bean, which also gave them their name (from a French comarou)¹. Various natural products such as organic and medicinal useful compounds contain coumarins as main structural unit². Usually they are used as linker in agrochemicals, cosmetic and drugs³ and in the synthesis of insecticides, optical brightening agents⁴, dispersed fluorescent and tunable dye lasers⁵. Coumarins are recognized to have several biological

activities such as antifungal, platelet aggregation⁶, antibacterial⁷, anticancer⁸, antioxidative properties⁹, anticoagulant, anhelmentic, hypnotic⁴, inhibitory of steroid 5- reductase¹⁰, anti-inflammatory and anti-HIV activities¹¹. Additionally coumarins act as main component of fluorocoumarins, chromenes, coumarones, and various medicinal plant¹². These properties make coumarins especially attractive target for organic chemists to prepare a number of designs of bioactive compounds.

Microwave irradiation is used as a tool for proficient synthesis of various compounds. The solvent-free conditions make reaction time shorter which is suitable for the synthesis of heterocyclic compounds¹³⁻¹⁷.

In the present work coumarin derivatives have been synthesized in solvent free conditions starting from substituted phenols along with methyl acetoacetate and ethyl acetoacetate in the presence of catalyst. Coumarin and its derivatives can be synthesized by various schemes that consist of Perkin reaction¹⁸, Knoevenagel reaction¹⁹, Wittig reaction²⁰, Pechmann reaction²¹, and Reformatsky reaction²². Between these reactions Pechmann scheme is mainly used for the research of substituted coumarins as it achieve with very straightforward primary resources and gives excellent yields of coumarin derivatives.

Traditionally the route consists of the condensation of phenols with β -ketoesters in the presence of a range of reagents to produce excellent yields of 4-substituted coumarins²³. Synthesis of heterocyclic compounds by microwave assisted process is widely adopted these days because of convenient operating condition. Preparation of heterocyclic compound have been reported in the presence of promoters, like polyaniline sulfate salt^{24,25}, heteropoly acids²⁶, zeolites²⁷, amberlyst 15²⁸, montmorillonite clay²⁹, nafion-11³⁰, potassium dihydrogen phosphate³¹, Zn[(L)-proline]₂ catalyst³², and various solid acid catalysts^{33,37}. Large amount of solid support (promoters) used in the reaction results in the production of huge quantity of poisonous waste. Furthermore Pechmann reactions have also been conducted by using CuFe₂O₄ nano particles³⁸, chloro aluminate ionic liquids^{39,41}, melamine formaldehyde resin supported H⁺ ion catalyzed⁴⁴, ionic liquid

Environmentally positive and energy proficient synthesis of coumarin by the Pechmann reaction via microwave irradiation

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In-vitro antioxidative potential of different fractions from *Prunus dulcis* seeds: Vis a vis antiproliferative and antibacterial activities of active compounds

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ABSTRACT

In the present investigation, antioxidant activities of different fractions of *Prunus dulcis* seed extract were evaluated. The warring blender method was employed for extraction and total phenol and flavonoid contents were correlated with the diverse antioxidant activities of different fractions that showed significant correlation with the total flavonoid content. Maximum antioxidative activities were exhibited by its ethyl acetate fraction which was selected for isolation of different compounds. Six pure compounds were isolated which were further evaluated for antiradical, antiproliferative and antibacterial activities. Out of six compounds, gallic acid, pyrogallol, ethyl gallate and protocatechuic acid showed potent 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity. Gallic acid and pyrogallol were also found to be antiproliferative on two breast cancer cell lines (MCF-7 and MDA-MB-468). Further, most of the compounds exhibited an antibacterial activity similar to chloramphenicol. To the best of our knowledge this is the first report on the antioxidant activities of four different fractions of *P. dulcis* seed and also on the antiradical, antiproliferative and antibacterial activities of the isolated compounds.

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1. Introduction

Autoxidation of polyunsaturated fatty acids of cells is associated with ageing and different diseases including cancer (Yin and Porter, 2005; Ackerman and Simon, 2014). Synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), widely used in the food industry are known to be carcinogenic in nature (Landete, 2013). Therefore, a great interest has been generated in supplementing them with natural antioxidants from plant sources. These are primarily polyphenols that commonly act as singlet oxygen quenchers and as reducing agents which can donate electron and can block the action of free radicals (Boeing et al., 2012).

It is believed that regular consumption of nuts, including almonds in moderate quantity lowers the risk of cardiovascular diseases (Chen and Blumberg, 2008; David et al., 2008). Nuts contain a good amount of phenolic compounds, terpenoids, pigments, and other natural antioxidants that are helpful in the protection from chronic diseases including cancer, primarily due to their secondary metabolites, fibre, vitamin E contents and some other compounds with antioxidant properties (Craig, 1997). Almond (*Prunus dulcis*) is one of the popular tree nuts that is a good

source of phenolic compounds and different secondary metabolites that are considered useful for preventing oxidative stress (Halliwell et al., 1992; Halvorsen et al., 2002). It is further suggested that polyphenols from almond skin may serve as the source of potent antioxidants and as antibiotic against *Helicobacter pylori* (Shengmin et al., 2002; Carlo et al., 2013). In fact, bioactive phenolic and flavonoids have been previously isolated from almond skin (Maria et al., 2007) and antiproliferative terpenoids from almond hulls (Amico et al., 2006) which have been evaluated for their antioxidative properties. Oxidative stress induced by free radicals alters the structure of biological substrates, which was believed to be one of the leading causes of cancer. Antioxidative phytochemicals present in fruits and vegetables can have overlapping mechanisms of action, including modulation of detoxification of enzymes, scavenging of these free radicals etc. and thus could prevent cancer (Dhingra et al., 2014a). It has been reported that polyphenols and flavonoids possess strong binding ability with microbial protein and glycoproteins to form complex through hydrogen bonding and hydrophobic effects, as well as by covalent bond formation and thus could inactivate microbial adhesins, enzymes, cell envelope transport proteins, ion channels etc. One of the mechanisms behind the antibacterial activity of flavonoids is by reducing outer and inner layers of membranes fluidity of bacterial cells. Metabolic perturbation is reported to be one of the major causes for bactericidal effect of flavonoids (Havsteen, 2002; Wagner and Ulrich-Merzenich, 2009).

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International Journal of Scientific Research and Reviews

In Vitro* Regeneration through Somatic Embryogenesis for Quality propagation of *Gerbera jamesonii

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ABSTRACT

Our study presents an efficient system for *in vitro* plant regeneration via somatic embryogenesis from leaves of *Gerbera jamesonii* cultured on Murashige and Skoog (MS) medium supplemented with various combinations and concentrations of growth regulators (cytokinins or auxins). Nodular, greenish brown callus was obtained from leaf sections when cultured on MS basal medium supplemented with 2.0 mg l⁻¹ 2, 4-D. Somatic embryo maturation and shoot regeneration was obtained in MS medium supplemented with 2.0 mg/l BAP and 3.0 mg/l IAA. Multiple shoot proliferation from the regenerated shoots was obtained under the influence of BAP (2.0 mg l⁻¹) and Kn (3.0 mg l⁻¹) followed by root induction using Indole-3-acetic acid (IAA 3.0 mg l⁻¹). Our results may facilitate mass production of high-quality *Gerbera* plantlets to meet up the demand of cut flowers in commercial market.

KEYWORDS- *Gerbera Jamesonii*; plant regeneration; Embryos; *in vitro* culture; Benzylaminopurine (BAP), Indole Acetic Acid

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Monochromatic radiation through light-emitting diode (LED) positively augments *in vitro* shoot regeneration in Orchid (*Dendrobium sonia*)

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Abstract

Monochromatic lights emitted by light-emitting diodes (LEDs) have generated great interest for efficient and controlled growth *in vitro*, especially of plants which are endangered or require specific intensity and wavelength of light. In the present study, we have evaluated the effect of monochromatic LEDs on *in vitro* morphogenesis: growth, proliferation of shoot cultures, and rooting of *Dendrobium sonia*. Different light sources viz. white LEDs (W), blue LEDs (B), yellow LEDs (Y) and red LEDs (R) were tested under photoperiod of 16 h of exposure and 8 h of dark. The frequency of morphogenesis depended on the wavelength of the applied monochromatic light. Higher wavelength monochromatic light (yellow light) was observed to induce higher shoot proliferation (93%), early PLB (protocorm-like bodies) formation, differentiation into green buds and shoot initiation as compared to red, blue and white light treatments. Yellow light also yielded higher number of shoots per explants (29 shoots/explant) than red, blue and white light treatments. The results suggest that the monochromatic light sources stimulate morphogenic effects on *in vitro* culture of *Dendrobium sonia*, and that yellow light treatment can be used to enhance the efficiency of micropropagation.

Keywords: *Dendrobium* sp., Plant regeneration, Protocorm-like bodies, *In vitro* culture, Light Emitting Diodes (LEDs)

Abbreviations: BAP - 6-Benzylaminopurine, IAA - Indole 3- Acetic Acid, MS - Murashige and Skoog medium, PLB - Protocorm-like bodies

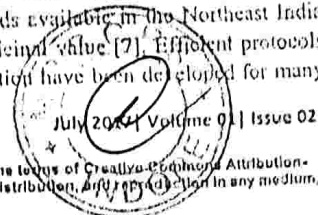
Introduction

Orchids are the monocotyledon ornamental potted plants belonging to the family Orchidaceae. They exhibit an incredible range of diversity in size, shape, and color of flowers and foliage. Orchids are categorized as threatened and endemic species of largest botanical family of higher plants by International Union for Conservation of Nature (IUCN) [1]. It is estimated that about 1,300 species (comprising 140 genera) of orchids can be found in India [2]. Orchids are well known for their economic importance and are widely cultivated for ornamental purposes and the production is now assumed at industrial level because of high

commercial value [3]. Usually, orchids are germinated through seeds but only in the presence of appropriate host [4]. Plant tissue culture technique has become very useful for the propagation and production of orchid plants of high commercial value [5]. Out of these, there are about 300 species available in India.

The genus *Dendrobium* is the largest genus belonging to Orchidaceae, with most members being epiphytic. *Dendrobium* has approximately 1500 species and almost one fourth of them are used for high ornamental value [6]. *Dendrobium chrysanthum* Wall. ex Lindl. is one of the valuable ornamental orchids available in the Northeast India because of its herbal medicinal value [7]. Efficient protocols for *in vitro* plant regeneration have been developed for many

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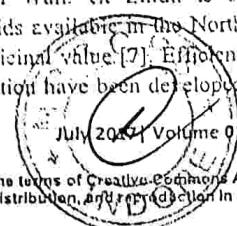
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Purification and Characterization of Polygalacturonase Produced by *Aspergillus niger* AN07 in Solid State Fermentation

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Abstract

Polygalacturonase, an industrial enzyme has been produced from various fungal isolates using solid state and submerged fermentation techniques. The challenge has been yield, extraction and cost of production. In the present study, a low cost solid substrate, dried papaya peel was employed for polygalacturonase production using *Aspergillus niger* AN07. Polygalacturonase enzyme from *Aspergillus niger* AN07 was purified to 24.8 fold with a 52.6% recovery through anion exchange chromatography on DEAE-cellulose and gel filtration chromatography using Sephadex G-200. The SDS-PAGE revealed that the enzyme was monomeric with a molecular weight of 64.5 kDa. The optimum pH and temperature were 5.0 and 55°C, respectively. This enzyme was stable over a wide pH range (4.0–7.0) and relatively high temperature of 55°C for 1 h. The *K_m* and *V_{max}* values of polygalacturonase for polygalacturonic acid were 2.6 mg/l and 181.8 µmol/ml/min, respectively. The purified enzyme could digest the polygalacturonic acid into oligosaccharides with a small amount of galacturonic acid as visualized on thin layer chromatography.

Keywords: Polygalacturonase, Purification, Characterization, DEAE-cellulose chromatography, Sephadex G-200 chromatography

Introduction

Pectin, a major constituent of plant cell wall is mainly composed of galacturonic acid residues. The enzymes that hydrolyze pectic substances are broadly known as pectinolytic enzymes, which include pectin methylesterase, polygalacturonase (exo-polygalacturonase and endo-polygalacturonase) and pectin lyase on the basis of their mode of action [1, 2]. Polygalacturonase is one of the most widely distributed enzymes in bacteria [3], fungi [4] and plants [5]. Polygalacturonase (pectinase; EC. 3.2.1.15) hydrolyzes the α-1, 4-glycosidic bond between galacturonic acid residues and releases oligomers of D-galacturonic acid.

Polygalacturonase has a share of 25% in the global sales of food enzymes and has numerous biotechnological applications such as in fruit juice extraction and its clarification, scouring of cotton, degumming of plant fibers, waste water treatment, vegetable oil extraction, tea and coffee fermentation, bleaching of paper, in poultry feed as additive and in alcoholic beverages [6-9].

Polygalacturonase has been purified and characterized from various fungal isolates viz. *Mucor flavus* [2], *M. circinelloides* [10], *A. niger* [11-13], *A. awamori* [14, 15], *A. carbonarius* [16], *Rhizopus oryzae*

[17], *Sclerotium rolfsii* [18], *Penicillium sp.* [19, 20], *Bispora sp.* [21] and *Neosartorya fischeri* [22].

Polygalacturonase production from microorganisms has been reported under both submerged (SmF) and solid-state fermentation (SSF) conditions [23]. SSF holds tremendous potential for the production of industrial enzymes. Agro-industrial residues are generally considered as suitable substrates for the production of enzymes in SSF [24-26].

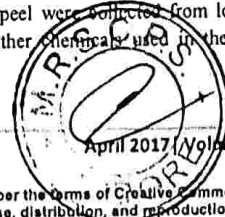
In the present study, polygalacturonase produced by locally isolated *A. niger* AN07 in SSF has been purified using ammonium sulfate precipitation, ion exchange and gel filtration chromatographies. The purified enzyme has been characterized for its physico-chemical properties.

Materials and Methods

Materials

Pectin, polygalacturonic acid and D-galacturonic acid were purchased from Sigma-Aldrich Chemical Co., USA. Microbial substrates, papaya peel and orange peel were collected from local juice shops and dried before use. Other chemicals used in the study were of analytical grade.

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Application of Jaya Algorithm for reactive power reserve optimization accounting constraints on voltage stability margin

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Abstract: Adequate reactive power reserve and voltage stability margin are important issues for secure operation of power system. Adequate reserve and margin is achieved by suitable settings of reactive power control variables. In view of this a novel technique to achieve the above mentioned objectives has been described in this paper. A quadratic performance index which minimizes deviation of reactive power generation from average generation output of the generators. This assures adequate reactive power reserve at various PV-buses on the lower as well as upper bound sides. The fitness function has been minimized using Jaya algorithm subject to desired voltage stability margin and accounting all equality and inequality operating constraints. The developed algorithm has been implemented on two standard test systems. The result obtained has been compared with those obtained using Teaching Learning Based Optimization technique (TLBO), Differential Evolution (DE) and Coordinated Aggregation Particle Swarm Optimization (CAPSO).

Keywords- voltage stability margin, reactive power reserve, reactive power control variables, jaya algorithm.

1. Introduction

Maintaining a desired voltage profile along with adequate voltage stability margin is an important and challenging problem for modern interconnected power network. In current operating state a desired voltage profile is obtained by base point settings of reactive power control variables e.g. PV- base voltages, shunt compensation and OLTC operations. To have desired voltage stability margin one should have

- i. adequate reactive power reserve
- ii. network capability to transfer the reactive power and
- iii. Voltage profile in current loading conditions [1].

For long time proximity indicators have been used for voltage security enhancement. Tiranuchit and Thomas [2] applied minimum singular value of jacobian to maintain desired voltage stability margin (VSM) and voltage profile.

Sensitivity analysis has been used by Begovic and Phadke [3] for improving voltage security Chebbo et al [4] developed algorithm for optimum reactive power dispatch employing LP and an optimal impedance solution on voltage stability index. Ajarapu et al [5] presented an optimal planning strategy for reactive power against voltage instability employing repeated load flow runs up to voltage collapse point. Bansilal et al [6] used least square optimization technique for maintaining desired VSM employing L- index [7]. Arya et al [8] described a method for static voltage stability improvements using a linearized model involving related sensitivities. Arya et al [9] presented a corrective rescheduling methodology for voltage stability margin enhancement using incremental linearized model and adapting a quadratic performance index so as to get closed form relations for obtaining settings of reactive power control variables: Pande et al [10] used functional link network for reactive power management and voltage stability enhancement. Titare et al [11] developed an approach to mitigate probability of voltage collapse accounting parameter uncertainties using improved PSO algorithm.

Taghavi et al [12] used Fuzzy technique to develop a reactive power optimization algorithm for hybrid system. Khazali and Kalantar [13] applied harmony search algorithm for obtaining optimal performance of the system based on reactive power considerations. Genetic algorithm has been employed for voltage stability margin enhancement and reactive power dispatch by Devaraj et al [14]. A preventive strategy for reactive power management along with VSM improvement has been developed by Mousavi et al [15]. Singh et al [16] developed a multi objective VAR management algorithm using modified differential evolution algorithm. Titare et al [17] used voltage dependent reactive power reserves modeling for voltage stability enhancement employing ensemble of mutation and crossover strategies and parameters in differential evolution (EPSDE). Fang et al [18] developed a robust optimal reactive power reserves dispatch under stochastic environment of load injected at buses employing chance constraints relaxation based method. Bhattacharya and Raj [19] used nodal





Determination of MW-generation Participation factors for Voltage Stability Enhancement Employing Jaya Algorithm

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ABSTRACT: This paper describes a methodology for improving voltage stability margin by rescheduling real power output of generating plants with incorporation of an efficient Jaya optimization algorithm. Normally this type of situation arises when system operates near collapse point and improvement is not possible using reactive power control variables due to their loss of controllability and/or limiting values. Optimum generation participation factors have been obtained for maximizing distance to voltage collapse by employing Jaya algorithm. Result has been obtained for a standard 57 bus IEEE test system.

Keywords: voltage stability margin, real power rescheduling, jaya algorithm,

I. INTRODUCTION

Modern interconnected power systems are operating close to their voltage collapse points due to increasing load and limitation of transmission network and sources. Under stressed operating condition coupling between real power and voltage increases and may be significant.

Thus impact of MW- generation rescheduling is an important consideration for improving voltage stability margin. Kirschen and Meeteron [1] employed MW-generation rescheduling for alleviating voltage limit violations. Further it was observed that voltage magnitude alone is not a good indicator for voltage stability considerations. Adequate voltage stability margin may not be available even adequate voltage profile is observed in power system. Hence Johansson *et al* [2] presented an algorithm for improving voltage stability by shifting MW- generation using classical optimization technique. Vishakha *et al* [3] used L-index and presented an algorithm for voltage stability improvement. Active power generation direction was obtained by Wang and Lasseter [4] for improving voltage stability limit using gradient search algorithm. Singh *et al* [5] presented and discussed MW-generation rescheduling at selected buses from voltage stability consideration viewpoint. Arya and Purey [6] employed modified bare bones particle swarm optimization technique for obtaining optimum real power generation participation factors to improve load ability margin of a power system.

In view of above this paper describes an algorithm for optimum real power rescheduling for voltage security improvement employing Jaya optimization algorithm. Section-II presents problem formulation. Section-III gives solution methodology and section-IV depicts results on a test system. Section-V gives conclusions.

II. PROBLEM FORMULATION

The objective is to maximize load ability limits with respect to MW-generation search direction [6]. Performance index [PI] is written as follows:

$$PI = (P_d^{lim} - P_d^0) \quad \dots(1)$$

P_d^{lim} maximum load ability

P_d^0 current loading points

Then PI indicates voltage stability margin. The above performance index is maximized subject to operating constraints given as follows.

(i) Load flow equations

The repeated load flow equations are written as follow

$$F(\underline{V}, \underline{\delta}, \underline{\alpha}, \underline{\eta}) = 0 \quad \dots(2)$$

In above \underline{V} , $\underline{\delta}$, represent voltage magnitude and phase angle vector, respectively. $\underline{\alpha}$ vector of MW- generation

participation factors, $\underline{\eta}$ bus load participation factors

(ii) Constraints on MW- generation participation factors
i.e



Enhancement of Voltage Security by MW-Generation Rescheduling based on Sensitivities using Black Hole

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 Electrical Engg. Electrical & Elex. Engg Electrical Engg Electrical & Elex. Engg Electrical & Elex. Engg VITS,
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Abstract—This paper presents a new methodology for improving voltage stability under stressed condition by active power rescheduling accounting inequality constraints. Whenever the reactive power control variables are exhausted, then only active power control variables are used to enhance the voltage profile as well as to obtain desired voltage stability margin. MW-generation rescheduling using the algorithm increases considerable voltage security margin and load bus voltage as well. The objective is to optimize minimum eigenvalue of load flow Jacobian which indicates the proximity indicator of present operating point to saddle node bifurcation point. The minimum eigenvalue of load flow Jacobian has been optimized using Black Hole (BH) algorithm. Proposed methodology has been implemented on IEEE 14-bus test system. Performance of the developed algorithm are compared based on statistical inference of the fitness function with, Teaching Learning Based Optimization (TLBO) and Particle Swarm Optimization (PSO) techniques. The simulation results are good enough to accept and validate the proposed methodology.

Keywords—MW-generation rescheduling; BH; Minimum eigenvalue; Static voltage stability.

I. INTRODUCTION

Power systems are being operated closer to their stability limits due to economic and environmental constraints. Voltage stability has become an increasingly important factor in the operation and planning of electric power systems. At any point of time, the power system operating condition should be stable; meeting various operational criteria and it should also be secure in the event of any credible contingencies. There are different measures against voltage instability in real time and in the planning and designing stage of a power system.

Reactive power management from voltage stability viewpoint has been an important issue in recent years. Enhancement in static voltage stability limit is usually achieved by rescheduling of reactive power control variables. Since power, networks are heavily loaded and operate very near to voltage collapse point. Moreover, reactive power resources, most of the times touch the limits. There are situations where voltage security enhancement by reactive power control variables may not be feasible. In such situation, voltage stability margin can be enhanced by rescheduling of MW-generation, if such possibility exists owing to strong coupling between active power and voltage under stressed condition, under outage

condition or due to excessive MW transfer along a transmission line, which may be dictated due to economic considerations [1]. Mansour et al. [2] used modal analysis for optimum location of static VAR compensation. A methodology for voltage stability improvement developed by Verma et al. [3] by controlling PV bus voltages and minimizing reactive power loss of the network. Mousavi et al. [4] presented a method of enhanced voltage stability margin by using reactive power management. Dike and Mahajan [5] presented voltage stability index-based reactive power compensation. Basu [6] presented a minimization of active power, voltage deviation and maximizing voltage stability by using reactive control variables. Titare et al. [7] developed an optimal reactive power rescheduling algorithm to enhance static voltage stability. All the research papers for voltage stability enhancement cited above use reactive power control variables for optimization. There may be situations where considerable voltage stability enhancement could be achieved by chosen MW-participations. Kirchen and Meeteren [8] have attempted to control the voltage within limit by MW-generation-rescheduling. However, voltage magnitude itself is a poor indicator of proximity to system collapse condition. Under emergency condition, the MVA distance to voltage collapse is of significance instead of voltage magnitude. Srivastava and Srivastava [9] presented the effect of generation rescheduling to enhance the voltage stability margin. Chung et al. [10] described a strategy to improve the power transfer capability constrained by small-signal stability by appropriate active power generation rescheduling based on sensitivity. Dutta and Singh [11] presented a technique for optimal generators rescheduling technique for congestion management based on sensitivities of power flow through congested line. Venkaiah and Vinod Kumar [12] presented a new methodology for static congestion management (CM) by optimal rescheduling of active powers of generators. The selection of generator buses was based on the sensitivity of the congested line. Proximity indicator becomes important in such situation. Singh et al. [13] presented new algorithm for active power generation rescheduling at selected generator.

This paper developed, a new methodology for optimizing the proximity indicator with respect to MW-generations will improve voltage stability margin. Minimum eigenvalue of load flow Jacobian has been used as a proximity indicator as well as objective function. As the system is stressed minimum eigenvalue continuously decreases and becomes zero at



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बैंक उपभोक्ता सेवाओं के संदर्भ में साधारण हिन्दी भाषा के प्रयोग पर एक अध्ययन

डॉ. दीप्ती बडजात्या (सेठी)

श्री क्लॉथ मार्केट कॉलेज ऑफ प्रोफेशनल स्टडीज, इन्दौर

प्रस्तावना

उदारीकरण के फलस्वरूप बैंकिंग क्षेत्र में प्रतिस्पर्धा अत्यधिक बढ़ती जा रही है जैसे बाजार से पूंजी उपलब्ध कराना, विभिन्न प्रकार के ऋण प्रदान करना, उत्पादों का प्रचार-प्रसार करते हुए उन्हें ग्राहकों तक पहुंचाना एवं उन्हें संतुष्ट करने में अधिकाधिक प्रयास करने होंगे तभी बैंकों की विकास गाथा जन-जन तक पहुंच पायेगी और जिसके फलस्वरूप समाज में प्रत्येक व्यक्ति के आर्थिक विकास का लक्ष्य भी पूर्ण होता प्रतीत होगा। इसी लक्ष्य को प्राप्त करने के लिए आवश्यक है कि बैंक की कागजी कार्यवाही में साधारण हिन्दी भाषा का प्रयोग हो जिससे बैंक ग्राहक आसानी से समझ सकें तथा किसी दूसरे पर निर्भर न हों। प्रायः यह देखा जाता है कि आवेदन पत्र या अन्य फार्म के हिन्दी प्रारूप में जटिलता आती है तथा उपभोक्ता विशेष रूप से ग्रामीण क्षेत्रों से सम्बन्धित व्यक्ति समझ नहीं पाते हैं तथा इसी कारण वे बैंक द्वारा प्रदान की जा रही सुविधाओं का लाभ नहीं उठा पाते हैं।

अतः प्रस्तुत अध्ययन में 100 उपभोक्ताओं, जिनका कि स्टेट बैंक ऑफ इण्डिया में खाता है, का अध्ययन किया गया। प्रश्नावली के माध्यम से सम्बन्धित प्रश्न पूछे गये। शोध क्षेत्र इन्दौर रहा तथा न्यायदर्श प्रणाली पर उपभोक्ताओं का चयन किया गया।

बैंकिंग उद्योग में सरकारी बैंकों को गैर बैंकों और अन्य वित्तीय संस्थाओं के साथ चुनौतीपूर्ण ही नहीं बल्कि गलाकाट प्रतिस्पर्धा का सामना करना पड़ता है। जब बैंक सामान्य रूप से सेवाएँ प्रदान करती हैं तब उनके लिए बाजार में अपने आप का स्वामित्व स्थापित होने में कठिनाई तथा जटिल प्रक्रिया बन जाती है अतः वे सिर्फ मूल्य एवं गुणवत्ता के आधार पर अपने आप को अलग कर सकती हैं इसलिए बैंक उद्योग के सामने ऐसी रणनीति को निर्धारित करना ताकि वह आने वाले समय में अपने ग्राहकों को दीर्घ समय तक बनाये रखे। यही रणनीति बैंक को वर्तमान युग के प्रतिस्पर्धा माहौल में जीवित रख सकती है। नए-नए ग्राहकों के साथ-साथ पुराने ग्राहकों का भी ध्यान रखना अनिवार्य हो जाता है। यह बैंक उद्योग के लिए किफायती भी है लेकिन अक्सर देखा जाता है कि अधिकतर ग्राहक का अपने बैंकों से लेनदेन व व्यापारिक रिश्ता ज्यादा समय तक नहीं ठहर पाता है, इसकी वजह यह है कि शुरूआती चरण में वाणिज्यिक रिश्ते पर बैंक द्वारा ज्यादा ध्यान दिया जाता है वहीं समय के साथ बैंक उद्योग अपने ग्राहकों की आवश्यकताओं पर ध्यान रखने में असमर्थ रहती है तथा इसी वजह से ग्राहकों का बैंक पर विश्वास कम होता जाता है। इसी तथ्य को ध्यान में रखते हुए शोध विषय का चुनाव किया गया है ताकि ऐसे मानकों का अध्ययन किया जाये जिससे ग्राहक बैंक की ओर प्रेरित हो तथा सकारात्मक रूप से बैंकों का प्रचार हो। बैंक भी वित्त पोषण आवश्यकताओं को उपलब्ध कराने तथा जमा सुरक्षा की सर्वोपरि जिम्मेदारी लेती है। इसके अलावा बैंकों पर आर्थिक रुझानों का प्रभाव दृष्टिगोचर होता है। सूचना प्रौद्योगिकी के विस्तार के साथ बैंक उद्योग के व्यापार संचालन में वृद्धि तथा व्यापार में कम्प्यूटर का रचनात्मक उपयोग से कार्य की गति एवं लचीलापन दृष्टिगत हुआ है।

ग्राहक प्रतिधारण के पीछे ग्राहक संबंध प्रबंधन (CRM) रिश्ता विपणन और वफादारी विपणन असली ताकत है। बैंकिंग उद्योगों के एक अध्ययन से पता चलता है कि एक मौजूदा ग्राहक को बनाए रखने की लागत, एक संभावित ग्राहक को प्राप्त करने की लागत की दर 10% है। इसलिए ग्राहक छोड़ने की दर कम की जानी चाहिए। वर्तमान आर्थिक परिदृश्य और मंदी में ग्राहक बनाए रखना चुनौतीपूर्ण है। समावेशी विकास के लिए एक आवश्यक शर्त है, स्वस्थ वित्तीय संस्थाओं और बैंकों को बढ़ावा दिया जाए। औद्योगिक व वित्तीय बाजारों में ग्राहकों के साथ दीर्घकालिक संबंधों पर जोर दिया जा रहा है। इसका आशय यह नहीं है कि कम अवधि की बिक्री वांछनीय नहीं है।

ग्राहक सेवा, संबंध विपणन का एक मुख्य घटक है और इसलिए ग्राहक को बनाए रखने में एक महत्वपूर्ण कारक है। इस प्रकार रिश्ता विपणन, एक विपणन उन्मुखकरण के साथ ग्राहक सेवा और गुणवत्ता को एकीकृत करने के लिए एक केन्द्र बिन्दु के रूप में देखा जा सकता है। प्रतिधारण विपणन में अधिकतम लेख रिश्ता विपणन के दर्शन पर लिखे जा रहे हैं और मुख्य रूप से कंपनी के मुनाफे और वित्तीय स्थिति और ग्राहक रोक दरों पर सुधार करने की योजना और इस पर प्रतिधारण विपणन के प्रभाव पर केंद्रित है। Dawkins और Reichheld का कहना है कि सेवा कंपनियाँ नए और संभावित ग्राहकों को आकर्षित करने



A STUDY ON DETERMINANTS OF CUSTOMER RETENTION IN BANKING SECTOR WITH SPECIAL REFERENCE TO SBI & ICICI

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Abstract

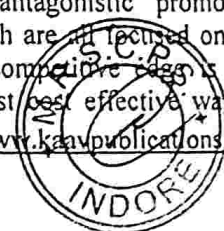
The banking industry is exceedingly cutthroat competitive, with banks not only challenging among each other; but also with non-banks and other financial organizations. Most banks' merchandise developments are uncomplicated to duplicate and when banks provide nearly similar services, they can only differentiate themselves on the basis of price, security in transactions, convenience, image, quality of services etc. Therefore, customer retention is potentially an effective tool that banks can use to gain a strategic advantage and survive in today's ever-increasing banking competitive environment. In this study, the determinants of customer retention has been measured and found the most important determinants from the employees and customers' perspectives. For this study total 500 customers and 200 employees from public and private banks were chosen. Through analyzing the mean, rank was assigned on the basis of the highest loadings.

Keywords: Customer Retention, Competitive Advantage, Determinants, Image, Quality of Services.

Introduction

It is more economical to keep customers than to acquire new ones. The costs of acquiring customers to "replace" those who have been vanished are sky-scraping. This is because the disbursement of acquiring customers is incurred only in the beginning stages of the commercial relationship. In addition, longer-term customers purchase more and, if satisfied, may produce positive word-of-mouth promotion for the organizations. Furthermore, long-standing customers also take less of the company's time and are less sensitive to price changes. Banks have the prime responsibility of providing financing requirements for businesses and carry the overriding responsibility of deposit safety. With these diverse challenges in the banking sector, most banks have moved out from the conventional strategies of product development and diversification, antagonistic promotion campaigns, promotional strategies and establishing branding strategies which are all focused on the external customers. In this case, use of customer service to provide a competitive edge is fast becoming everyone's strategy and customer retention has become the most effective way of

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A STUDY ON CRM PRACTICES AND ITS IMPACT ON CUSTOMER SATISFACTION IN BANKING
SECTOR (WITH REFERENCE TO SBI & ICICI)

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ABSTRACT

Indian Banking sector is booming every day, it is very clear in competitive context that it has to be customer centric. As new private players are entering, it is mandatory for public sector to develop proper understanding of the customers' needs and expectations. Understanding of customers and changing demand is must along with a prompt response. CRM in this context is a proper methodology and an organized way to develop customers understanding. CRM principally is a deep analysis of consumer behaviour. The customer target base is broadening day by day. And to sustain and fight the competition marketers have been equipped with a mantra that is CRM which enables marketers to maintain their presence. Flourishing trend in banking sector of India is expected to continue for everlasting, and it is attracting huge attention. Attitudinal shift of the Indian consumer and the emergence of ICT have transformed the face of banking sector in India. It has been perceived as a key opportunity area. Present study provides detailed information about the growth of banking industry in India. It further examines the preference and perception among people across different socio-economic classes in India and how the urban and semi-urban retail markets are witnessing significant growth.

Keywords; Banking Sector, CRM (customer relationship management), Customer satisfaction, ICT, Growth.

Introduction

Banking is considered as one of the vital contributors to the economic growth of a country. It serves as the central channel for all economic activities. The banking industry in India has undergone fundamental changes post-independence. The opening up of the economy in the 1990s and the government's decision to privatize banks by reduction in state ownership culminated in the banking reforms based on the recommendations of the Narasimham Committee. Madhok and Zaveri have stated that banking industry has witnessed a sea change since colonial times when profit was the prime consideration. It then moved to the socialist era of seventies and eighties where serving the poor in the remotest corners of India was the only goal. During this era, nationalized banks have started function with a view to give access to organized banking to as many people as possible. Bank policies were solely directed towards achieving the social objectives of employment generation and social welfare. Profit motive took a back seat.

Banking Sector in India has passed through an exciting and challenging phase. The reforms in the Indian financial sector have led the Indian Banking to undergo drastic changes through the creation and diversification of products/ service portfolio, entry of new Private Sector and foreign banks, institutional changes, adoption of modern technology, globalization of banking activities etc. The system has expanded rapidly after nationalization in 1969 and 1980. The banking services that were mostly confined to urban areas are now expanded to rural areas also. Since 1990s the government has been implemented many banking sector reforms which have completely changed the pace, face and character of Indian banking sector.

With the current change in the functional orientations of banks, the entire purpose of banking has been redefined. Therefore, the banking sector has passed through economics and accept challenges and there is no exception. As per several studies, following are the key challenges of change in the banking industry:



A STUDY ON MULTI COMMODITY MARKET AND ITS IMPACT ON BUSINESS CYCLES

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Abstract

Currently there is growing craze of commodity trading in India. Numbers declared from exchanges like Multi-commodity Exchange (MCX), ICEX (Indian Commodity Exchange), National Spot Exchange Limited (NSEL) shows the growth in volume day by day. But, there is also a negative corner to it, many times retail investors' lose money in commodity market. Why this happens.... There is no fantastic market than it, then also why we are not able to make money in this market? Lack of knowledge of market is the major reason behind it. In this post, we have taken a view of factors which affects commodity market. Hopefully it will helpful to commodity traders. This study found the impact of multi commodity market affecting business growth and development so total 100 businessmen were selected dealing in different products and commodities. The findings of the study concluded that due to the volatility of the market price has a greater impact on business.

Keywords: MCX, Growth of Business, Price Strategy, Market Volatility

Introduction

The World Bank report notes that the global commodity market prices continue to remain weak. However, owing to the renewed weather-related concerns in the grain markets and resurface of geopolitical tensions in the Middle East, there exists a revivification of short term risks to the upside in energy markets. The market has experienced a sharp decline in the prices of metals and precious metals in the last year (2012). Dwyer, Gardner and Williams (2011) encountered a significant enhancement in the global commodity market with regard to the volatility and levels of prices over the recent past. These gains have awakened a number of anxieties for policymakers, permitting the potential for rising commodity prices with some developing nations particularly concerned about rising food prices. The G-20 has been devoted to work to address excessive commodity price volatility', with a direction on the role played by the growing presence of financial investors in commodity markets. A discussion of the relationship between business cycles and commodity economy should, therefore, consider the interaction between supply and demand responses and





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Purification and Characterization of Pectin Methylesterase Produced in Solid State Fermentation by *Aspergillus tubingensis*

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Authors' contributions

This work was carried out in collaboration between all authors. Author MKP carried the experimental work and wrote the first draft of the manuscript. Author AN designed the study, supervised the experimental work, prepared the figures. Author SN also designed the experiment, checked and corrected the first draft of the manuscript. Author AK designed the experimental work, managed the literature search and finally corrected the entire manuscript. All authors read and approved the final manuscript.

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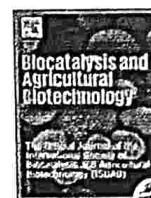
ABSTRACT

Aim: Purification and characterization of pectin methylesterase produced by *Aspergillus tubingensis* in solid state fermentation.

Study Design: Pectin methylesterase enzyme produced by *A. tubingensis* was extracted from the fermented solid medium and purified using chromatographic techniques. The purified enzyme was characterized for physico-chemical and kinetic properties.

Place and Duration of Study: Experiments were performed at the School of Biotechnology, Devi Ahilya University, Indore, INDIA and Maharaja Ranjit Singh College of Professional Sciences, Indore, INDIA, between October, 2014 and August, 2015.

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Papaya peel valorization for production of acidic pectin methylesterase by *Aspergillus tubingensis* and its application for fruit juice clarification



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ABSTRACT

Production of an extracellular, acidic pectin methylesterase was carried out by a newly isolated fungal strain identified as *Aspergillus tubingensis* using dried papaya peel under solid state fermentation. Response Surface Methodology involving Box-Behnken Design was employed for the optimization of process parameters viz. moisture content, period of fermentation, inoculum size and particle size of papaya peels. Maximum yield of pectin methylesterase was 246.83 U/g dried substrate, obtained by inoculating 10 g of papaya peel with 1×10^7 spores/ml, at initial 86% moisture content and particle size 2 mm after 120 h of fermentation period. The nearly same optimized values ($R^2=0.99$) and experimental values ($R^2=0.96$) indicated the validity of the statistical model. Under these experimental designs, the yield of pectin methylesterase increased 3.39 fold, which was much efficient and economical than "one factor at a time" methodology. Crude pectin methylesterase showed maximum activity at 50 °C and pH 4.6. Addition of partially purified enzyme increased the pineapple juice clarity as indicated by an increase in % transmission at 650 nm from 3.1 to 19.5 and decrease in pH from 4.3 to 3.0.

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1. Introduction

Pectin is a complex macromolecular component of the plant cell walls. It is a methoxylated galacturonic acid polymer that provides integrity and rigidity to plant tissues (Callall and Mohanen, 2009). It is sequentially hydrolyzed by pectin methylesterase and polygalacturonase enzymes for cell separation (Ridley et al., 2001). Pectin methylesterase (pectinesterase, PME, EC 3.1.1.11) catalyzes the deesterification of pectin, yielding methanol and the pectin with a lower degree of esterification called pectate (Duvetter et al., 2005; Jolie et al., 2010) which acts as a substrate for polygalacturonase (PG, EC 3.2.1.15), an enzyme that depolymerizes the polysaccharide chain (Dey et al., 2014). Pectinmethylesterase is produced by plants (Fayyaz et al., 1995; Deytieu-Belleau et al., 2008), plant parasites (Shrivastava et al., 1994) and many different plant pathogenic and saprophytic organisms including bacteria

and fungi (Plaza et al., 2008; Jolie et al., 2010). Microbial pectinolytic enzymes are among the most important industrial enzymes and are of great significance with wide range of applications in fruit juice extraction and clarification, textile processing, degumming of plant bast fibers, treatment of pectic wastewaters, papermaking and coffee and tea fermentations (Kashyap et al., 2001; Jayani et al., 2005).

Pectinolytic enzyme production from microorganisms has been reported in both submerged (SmF) and solid-state (SSF) fermentation conditions (Berovic and Ostrover'snik, 1997; Favela-Torres et al., 2006). High availability of the solid substrate, less chances of contamination due to less water content and no requirement of continuous agitation are the advantages of SSF over SmF for fungal biomass development. Also, it is easy to extract extracellular enzyme from SSF medium (Pandey, 2003; Viniegra-González et al., 2003; Rodriguez Couto and Sanroman, 2006). Various agro-industrial waste viz. coffee beans (Tai et al., 2014), lemon peel (Ruiz et al., 2012), orange peel (Zhou et al., 2011), grape pomace (Diaz et al., 2012), orange bagasse and wheat bran (Silva et al., 2005), lemon pulp (De Gregorio et al., 2002), wheat grains (Bhardina et al., 2002), strawberry pomace (Zheng and Shetty, 2006), wheat and soy bran (Castilho et al., 2000) and apple pomace (Berovic and Ostrover'snik, 1997) have been used in SSF for fungal pectinolytic enzyme production. Utilization of solid waste has focused more on production of polygalacturonase and very few reports are

Abbreviations: ITS, Internal Transcribed Spacer; BBD, Box-Behnken Design; PDA, Potato Dextrose Agar; RSM, Response Surface Methodology; SEM, Scanning Electron Microscope; SmF, Submerged Fermentation; SSF, Solid State Fermentation; U/gds, Unit per gram dried substrate

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RESEARCH ARTICLE

Utilization of Natural Adsorbents in the Elimination of Toxic Metal Ions in Industrial Effluents: A Review

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ABSTRACT:

The ability of agricultural solid waste and horticultural waste and other natural solid waste such as biological origin or organics, minerals, rice husk, zeolite, clay, peat moss, chitosan, saw dust, mangifera indica (mango), egg shell in the treatment of industrial effluents containing toxic metal ions in aqueous solution were reviewed. This biosorbents and natural adsorbents has been found to serve as an alternative material to the usual methods of effluents treatment, and have the capability to react positively in eliminating toxic metal ions. The sound effects of essential parameters such as equilibrium time, preliminary metal ion, concentration, maximum biosorption capacity, adsorbent dose, particle size, pH of the solution, contact time, batch and column studies were also shown. This review presents the use of existing agricultural solid wastes, horticultural waste and different natural adsorbents to remove different Pollutants (Cr^{2+} , Zn^{2+} , Cd^{2+} , Fe^{2+} , Ni^{2+} , Pd^{2+} , Hg^{2+} , As^{3+} etc.) and the effect of treatment on their efficiencies.

KEYWORDS: Horticultural waste, Pollutant, Elimination, Industrial, Adsorbent, Toxic, Effluent.

INTRODUCTION:

Industrial effluents constitute the most important cause of different types of toxic metal ions pollution in natural water. Effluent generated from industrial treatment plant contains significant toxic metal ions contaminants. Their concentrations must be reduced to safe levels before being released into the environment. Fast industrialization has led to rise dumping of toxic metal ions into the environment. These poisonous metal ions entered into the water bodies through effluent from metal plating industries and industries of Cd- Ni, stabilizers alloys, pigments, mining operations, metal plating, tanneries, radiator built-up, chlor alkali, smelting, storage space batteries industries and alloy industries etc.

A physicochemical technique includes adsorption, chemical precipitation, coagulation, ultra filtration, etc. Among of these methods adsorption is the most economical and effective because of their relative low cost. The adsorption process is being generally used by different researchers for the elimination of toxic metal ions from waste streams. Adsorption is one of the safest, easiest and most cost-effective methods for the elimination of these metals from industrial effluent. Toxic metal ions that are released into the environment tend to persist indefinitely, accumulating in living tissues throughout the food chain and are posing a serious threat to the public health and environment.

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Development of Activated Carbon from *Jatropha* Husk by Chemical Activation with NaOH

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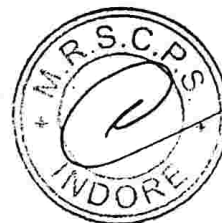
Abstract

Jatropha Curcus is an important plant for the production of biodiesel. In the production of biodiesel huge volume of *jatropha* husk is generated which are consider as biodiesel waste. In the present study an attempt was made to determine the optimum condition to convert this biodiesel waste into the activated carbon by chemical activation method using NaOH as an activating agent. The effect of activation temperature, Impregnation ratio and activation time were examined for the synthesis of activated carbon. Physico-chemical parameters viz moisture content, ash content, volatile matter content and carbon content of prepared activated carbon were also examined. This study found that biodiesel waste is efficient raw material for the preparation of activated carbon.

Key words: *Jatropha* husk, Optimum condition, Biodiesel waste, Activated carbon.

Introduction

Jatropha Curcus is an important plant for the production of biodiesel. In the production of biodiesel, huge amount of *Jatropha* husk as biodiesel waste are produce. These *Jatropha* husk like other agricultural waste cannot be used as agricultural fertilizer although *Jatropha* husk rich in cellulose, hemicelluloses and lignin¹. Degradation and digestion is not possible. So it is better to use *Jatropha* husk for the preparation of activated carbon. This activated carbon is excellent adsorbent and can be used to purify, decolourize, detoxicate, filter or remove dissolved substances. This biodiesel waste converted into activated carbon through these steps: dehydration, carbonization and activation². Moisture is removing from raw material in dehydration step. During carbonization step, organic matter of raw material is converted into primary carbon. Now primary carbon is activated in activation method. Activation of carbon is done by two method that is gas activation method and chemical activation method. In this research chemical activation is done by treating primary carbon with NaOH. Some parameters like activation temperature (500-900°C), Impregnation ratio (1:1-2:1) and activation time (0-120 min) were studied and determine the best suitable condition for the preparation of activated carbon^{1,2}. This paper presents preparation of activated carbon from *Jatropha* husk by chemical activation method treating with NaOH.



Enhancement Of Actinobacterial Protease Production by Optimizing Fermentation Parameters

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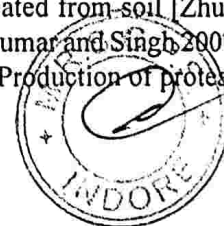
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Abstract

Actinomycetes were isolated from soil, compost pit and vermicompost samples. Protease producing actinomycetes were screened and out of twenty five cultures, ten were positive for protease production. Actinomycete isolate MG4 was selected for optimizing submerged fermentation technology. MG4 produced 264 EU/ml of protease in submerged fermentation. The selected isolate grew on Bennett's medium with typical powdery texture and ivory aerial spore mass. MG4 exhibited straight chain spore arrangement pattern on morphological analysis by slide culture technique. Optimization of protease production process was done and the maximum production was observed at 30°C and pH 7 in 72 hours. Medium containing soybean residue promoted the protease production to maximum (316 EU/ml).

Introduction

Actinobacteria are filamentous prokaryotes, rich in GC content. They are a peculiar group of bacteria predominantly present in soil. They are slow growers and play a very important role in mineralization. Actinobacteria can breakdown a wide variety of organic macromolecules which are difficult to degrade. The extensive range of enzymes produced by them allow these filamentous bacteria to survive in extreme climates also. Actinomycetes have been isolated from soil [Zhu et al. 2007, Atalan et al. 2000], water [Zaitlin et al. 2003], insects, salt lakes [Thumar and Singh 2007], hot springs [Song et al. 2009], marine environments etc [Tian et al. 2009]. Production of protease



Sink-Source System of *In vitro* Suspension Culture of *Celastrus paniculatus* under Regulation of Monochromatic Lights

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Key words: Cell suspension culture, Secondary metabolites, *Celastrus paniculatus*

Abstract

Plants are wonderful resource of bioproducts encompassing significant value to medicines and drug development. The plant cell suspension cultures bear immense potential for production of high-value secondary metabolites and are chosen as alternative source of raw material for industrial use. In the present study, homogenous cell suspension culture of *Celastrus paniculatus* a medicinally important plant was established and multifold production of alkaloids and total phenols was obtained under the influence of monochromatic lights. One month old leaf derived friable callus of *C. paniculatus* was used to raise homogenous suspension culture and kept on rotary shakers in cabinets illuminated with different monochromatic LED lights (Blue, Yellow and Red). The monochromatic lights proved to be a strong abiotic elicitor in driving the production of secondary metabolites so much so that the metabolites were released extracellularly and the medium served as sink or spacious pool for leaked out metabolites from the cell mass. Maximum production and enhancement in alkaloids and phenols (98 and 44.7%, respectively) over control was obtained from cell mass grown under yellow light treatment, followed by blue (64 and 23.7%) and red light (50 and 26%) treatments. Further scale up of secondary metabolite production was hence performed under yellow light conditions, starting from 2.5 gm cell mass suspended in 250 ml of media extended up to 1000 ml culture media for one month. The continuous culture system exhibited remarkable potential of this plant cell system as multifold yield of total alkaloids

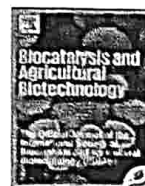
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Biocatalysis and Agricultural Biotechnology

journal homepage: www.elsevier.com/locate/babPapaya peel valorization for production of acidic pectin methylesterase by *Aspergillus tubingensis* and its application for fruit juice clarificationMukesh Kumar Patidar^a, Sadhana Nigohkar^b, Anil Kumar^a, Anand Nigohkar^{c,*}^a School of Biotechnology, Devi Ahilya University, Khandwa Road, Indore 452001, India^b Mata Gujri College of Professional Studies, A.B. Road, Indore 452001, India^c Maharaja Ranjita Singh College of Professional Sciences, Hemkum Campus, Khandwa Road, Indore 452001, India

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ABSTRACT

Production of an extracellular, acidic pectin methylesterase was carried out by a newly isolated fungal strain identified as *Aspergillus tubingensis* using dried papaya peel under solid state fermentation. Response Surface Methodology involving Box-Behnken Design was employed for the optimization of process parameters viz. moisture content, period of fermentation, inoculum size and particle size of papaya peels. Maximum yield of pectin methylesterase was 246.83 U/g dried substrate, obtained by inoculating 10 g of papaya peel with 1×10^7 spores/ml, at initial 86% moisture content and particle size 2 mm after 120 h of fermentation period. The nearly same optimized values ($R^2=0.99$) and experimental values ($R^2=0.96$) indicated the validity of the statistical model. Under these experimental designs, the yield of pectin methylesterase increased 3.39 fold, which was much efficient and economical than "one factor at a time" methodology. Crude pectin methylesterase showed maximum activity at 50 °C and pH 4.5. Addition of partially purified enzyme increased the pineapple juice clarity as indicated by an increase in % transmission at 650 nm from 3.1 to 19.5 and decrease in pH from 4.3 to 3.0.

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1. Introduction

Pectin is a complex macromolecular component of the plant cell walls. It is a methoxylated galacturonic acid polymer that provides integrity and rigidity to plant tissues (Caffall and Mohanen, 2009). It is sequentially hydrolyzed by pectin methylesterase and polygalacturonase enzymes for cell separation (Ridley et al., 2001). Pectin methylesterase (pectinesterase, PME, EC 3.1.1.11) catalyzes the deesterification of pectin, yielding methanol and the pectin with a lower degree of esterification called pectate (Duvetter et al., 2003; Jolie et al., 2010) which acts as a substrate for polygalacturonase (PG, EC 3.2.1.15), an enzyme that depolymerizes the polysaccharide chain (Dey et al., 2014). Pectinmethylesterase is produced by plants (Fayyaz et al., 1995; Daytieu-Belleau et al., 2008), plant parasites (Shrivastava et al., 1994) and many different plant pathogenic and saprophytic organisms including bacteria

and fungi (Plaza et al., 2008; Jolie et al., 2010). Microbial pectinolytic enzymes are among the most important industrial enzymes and are of great significance with wide range of applications in fruit juice extraction and clarification, textile processing, degumming of plant bast fibers, treatment of pectic wastewaters, papermaking and coffee and tea fermentations (Kashyap et al., 2001; Jayani et al., 2005).

Pectinolytic enzyme production from microorganisms has been reported in both submerged (SmF) and solid-state (SSF) fermentation conditions (Berovic and Ostrovsnik, 1997; Favela-Torres et al., 2006). High availability of the solid substrate, less chances of contamination due to less water content and no requirement of continuous agitation are the advantages of SSF over SmF for fungal biomass development. Also, it is easy to extract extracellular enzyme from SSF medium (Pandey, 2003; Viniestra-González et al., 2003; Rodriguez Couto and Sanroman, 2006). Various agro-industrial waste viz. coffee beans (Tai et al., 2014), lemon peel (Ruiz et al., 2012), orange peel (Zhou et al., 2011), grape pomace (Diaz et al., 2012), orange bagasse and wheat bran (Silva et al., 2005), lemon pulp (De Gregorio et al., 2002), wheat grains (Blandino et al., 2002), strawberry pomace (Zhen and An, 2000), wheat and soy bran (Castilho et al., 2000) and apple pomace (Berovic and Ostrovsnik, 1997) have been used in SSF for fungal pectinolytic enzyme production. Utilization of solid waste has focused more on production of polygalacturonase and very few reports are

Abbreviations: ITS, Internal Transcribed Spacer; BBD, Box-Behnken Design; PDA, Potato Dextrose Agar; RSM, Response Surface Methodology; SEM, Scanning Electron Microscope; SmF, Submerged Fermentation; SSF, Solid State Fermentation; U/g, Unit per gram dried substrate.

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Purification and Characterization of Pectin Methylesterase Produced in Solid State Fermentation by *Aspergillus tubingensis*

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Authors' contributions

This work was carried out in collaboration between all authors. Author MKP carried the experimental work and wrote the first draft of the manuscript. Author AN designed the study, supervised the experimental work, prepared the figures. Author SN also designed the experiment, checked and corrected the first draft of the manuscript. Author AK designed the experimental work, managed the literature search and finally corrected the entire manuscript. All authors read and approved the final manuscript.

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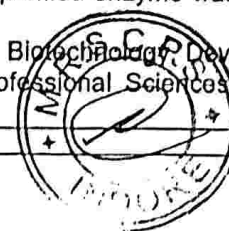
ABSTRACT

Aim: Purification and characterization of pectin methylesterase produced by *Aspergillus tubingensis* in solid state fermentation.

Study Design: Pectin methylesterase enzyme produced by *A. tubingensis* was extracted from the fermented solid medium and purified using chromatographic techniques. The purified enzyme was characterized for physico-chemical and kinetic properties.

Place and Duration of Study: Experiments were performed at the School of Biotechnology, Devi Ahilya University, Indore, INDIA and Maharaja Ranjit Singh College of Professional Sciences, Indore, INDIA, between October, 2014 and August, 2015.

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Active Power Rescheduling for Avoiding Voltage Collapse Using Modified Bare Bones Particle Swarm Optimization

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Abstract MW-generation rescheduling is being considered for voltage stability improvement under stressed operating condition. At times it can avoid voltage collapse. This paper describes an algorithm for determination of optimum MW-generation participation pattern for static voltage stability margin enhancement. The optimum search direction has been obtained by employing modified bare born particle swarm optimization technique. Optimum search direction is based on maximization of distance to point of collapse in generation space. Developed algorithm has been implemented on a standard 25 bus test system. Results obtained have been compared with those obtained using standard particle swarm optimization.

Keywords Voltage stability · Particle swarm optimization · Bare bones particle swarm optimization · MW-generation rescheduling · Loadability

Introduction

Voltage stability consideration is of great significance for large inter-connected power systems which usually operate near to saddle node bifurcation point (SNBP). Large numbers of research articles have been published for voltage stability enhancement using reactive power control

variables [1–5]. In some situations adequate voltage stability margin may be obtained by suitable selection of MW-generation participation. Generation direction based on economic criteria may give rise to lower voltage stability margin which may not be sufficient to avoid voltage instability under sudden load increase condition. Under certain situations it may not be possible to provide adequate loadability margin by rescheduling reactive power control variables. These situations may arise due to (a) network limitation to transfer reactive power and (b) source capability to supply reactive power [6]. Kirschen and Meeteren [7] were probably the first to exploit MW-voltage relationship for alleviating voltage violations by MW-generation re-dispatch. Under emergency condition the distance to voltage collapse from current operating point is of much concern. Hence MW-generation participation must be based on voltage stability considerations rather than economic considerations. Johansson et al. [8] developed a fast active power rescheduling algorithm for avoiding voltage collapse under dynamic situation. Karbalaee et al. [9] used a classical optimization technique for obtaining saddle node bifurcation point (SNB). El-Dib et al. [10] used hybrid particle swarm optimization (HYPPO) to obtain maximum loadability point. Vishakha et al. [11] used L-index [12] and developed a strategy for voltage stability margin improvement. Wang and Lasseter [13] developed an algorithm for voltage security margin enhancement using gradient search method and obtained optimum active power generation direction. The boundary of maximum loadability point may be either a point of collapse (POC) or a low voltage boundary or a thermal limit boundary. The consideration in this paper is to determine relative participation of each generator so as to maximize distance to poc from current operating points. A computationally efficient methodology known as bare

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Development of Activated Carbon from *Jatropha* Husk by Chemical Activation with NaOH

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Abstract

Jatropha Curcus is an important plant for the production of biodiesel. In the production of biodiesel huge volume of *jatropha* husk is generated which are consider as biodiesel waste. In the present study an attempt was made to determine the optimum condition to convert this biodiesel waste into the activated carbon by chemical activation method using NaOH as an activating agent. The effect of activation temperature, Impregnation ratio and activation time were examined for the synthesis of activated carbon. Physico-chemical parameters viz moisture content, ash content, volatile matter content and carbon content of prepared activated carbon were also examined. This study found that biodiesel waste is efficient raw material for the preparation of activated carbon.

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