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Editorial ....

It is a pleasure to present this year's second issue of the *Indian Journal of Current research* (IJCR) to our audience. Our editorial board is excited to observe continuous growth of the journal and its formation into a true multidisciplinary publication. The journal is continuing to receive very interesting and high-quality manuscripts from all over the Country.

Continuous expansion of IJCR is also reflected on manuscripts in the field of Science and Arts . Our editorial board is anticipating it to be very successful, and is observing its further development with great interest. It is an enormous privilege for me to spearhead this section in future editions of IJCR.

The articles in this issue cover a broad variety of topics. In the following sections, I will briefly review the articles published in this issue, including two articles in arts and 7 articles in Science. All these articles focus on current issues and provide platform for research.

At the end of this preface, I want to thank our readers and authors for their continuing interest in IJCR, and each and every member of our editorial and review boards for hard work and dedication, which made it possible to bring another issue of JCDR to our broad multidisciplinary national audience.

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M-LEARNING AND ITS ISSUES: AN OVERVIEW

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Abstract:

Traditional E-Learning systems developed for laptop and desktop computers were based on individual software application or through websites and lack the ability to provide a complete ubiquitous learning environment. A ubiquitous learning environment based on early period mobile phones lack the handling power of laptops or desktop computers, low data transfer speeds and capacity. However, the capability to provide an entire ubiquitous learning environment on the 3G (3rd Generation) mobile device will offer powerful collaborative and interactive learning opportunities. Thus the development of interactive models of mobile learning (M-learning) application for Android based mobile devices using web services to facilitate the complete ubiquitous learning becomes essential nowadays. This paper deals with the various issues and challenges to accomplish the task.

Keywords*: E-learning, ubiquitous learning, moodle and m-learning*

1. INTRODUCTION

Educational Technology is constantly evolving and growing, and this progression will continually offer new and interesting advances in our learning environment. Long-established E-Learning systems i.e. Electronics learning developed for laptop and desktop computers were based on stand-alone software application or through websites but E-learning system had failed to provide a comprehensive ubiquitous learning environment means anytime anywhere learning environment. A ubiquitous learning environment (ULE) is any setting in which students can become totally involved in the learning process. Ubiquitous learning provides the learner the freedom from geographical boundaries, devices and learning content format and rather emphasize on the constructivist learning process and cognitive development among learners. Using portable computing devices (such as laptops, tablet PCs, PDAs, and smart phones) with wireless networks enables mobility and mobile learning, allowing teaching and learning to extend to spaces beyond the traditional classroom. Since the mobile devices support the anytime, anywhere learning, m-learning i.e. mobile learning can foster the growth of the ubiquitous learning (U-learning). M-learning application framework enables the learner to access the learning object and interact with the instructor and other learner seamlessly from the tablet PCs while in class, from his mobile phone during traveling or from his laptop when at home.

Mobile learning is significant because it's a quickly growing trend. Compared to just a few years ago, mobile learning devices have become a

solution of easy student computer interaction.

2. RESEARCH INITIATIVES

Application development for mobile phones is not uncommon. For example, users nowadays can easily read news, e-mails etc using mobile phones.

In several e-business applications using mobile technology such as PDA's and mobile phones are discussed. These mobile applications are used for various business activities such as hotel check-ins, insurance quotations request and registering, online railway reservation.

In healthcare environment several mobile applications have already been developed and used. For example, a mobile phone application known as patient-centered assessment and Counseling mobile energy balance (PmEB) is used to allow it's user to do self monitoring of their caloric balance in real time. Basically the user of the application would enter their calories consumption and physical activity for the day and the application then calculate their caloric balance. Whereas in a mobile application that can give verbal motivation and encouragement to obese teenagers to be involved in physical activities is proposed.

As for University domain, several projects have been developed for mobile devices, such as 'Moodlbile: Extending moodle to the mobile on/offline scenario' which were developed by Marc Alier Forment and Mª José Casany Guerrero from the University Catalunya (Spain).

This system was developed for mobile scenario for the most popular Free Open Source Software (FLOSS) learning management system i.e LMS: Moodle. The main goal of the project was to extend to mobile devices the most commonly used activities of a Moodle course: forum, calendar, wiki, glossary and internal mail, in a way that the mobile user may work online as well as offline.

Moodle(Modular Object Oriented Dynamic Learning Environment) is LMS software, and also an Open Source community of more than 350.000 members that releases the FLOSS LMS leader in the market worldwide. Founded in 1999 by Martin Dougiamas, nowadays Moodle is available in 75 languages with registered installations used by more than 15 million students worldwide.

This project delivers an operational rototype of integrated web-based learning and mobile-learning environment. This leads to a whole field of experimentation and research on real classrooms, considering that there already exists a wide base of J2ME enabled terminals. Marc Alier Forment and Mª José Casany Guerrero proposed that by fall 2009 it should be developed in the Android version as well.

3. M-LEARNING

Mobile communication technologies are changing the way people educate themselves. Today's learners, those born after 1982, are 'digital natives'. They are usually digitally literate, 'always on' and are used to perform multiple tasks simultaneously, like playing computer games while watching TV. Learning outside the classroom targets an increasingly mobile population interacting with an also mobile society. It is about making use of the multimedia capabilities offered by mobile phones in increasingly sophisticated ways. In this context, collaborative learning is a set of learning activities that enables the group members to enjoy the learning scenario and reach common goals through affective and cognitive comprehension, cooperative

work-sharing and social interaction. To promote social interaction in a classroom context the teacher should first try to motivate students to inquire and participate.

The use of ubiquitous devices to enhance students' learning in museums has been developed with great success (Pace et al., 2008; Beg & Ibrahim, 2009). In field trips or museum visits, one can get information about the place while going there and during the visit to enhance the experience (to capture or record what is happening, like a tour guide explanation). From then on, why not send it or post it into a message board, a Website, or a blog? By doing so, the recorded pictures or videos would be associated with that specific learning module for as long as it remained active. Also, this would suppress the need to store those taken pictures or recorded videos in the device, freeing up valuable disk space. With this method a much more enriching experience is provided because the learner has access to the knowledge beforehand, during the visit and afterwards.

Learning outside the classroom may be more effective and a learner only needs a mobile device. One user will be more used to it (save the experience period) and when school or work finishes the learner keeps the device and it can then be used at home and on weekends. Then, learners can study subjects that interest them using their own time. Independent exploration to complete school based tasks or homework is a very effective way of really understanding a material.

Another great value of m-Learning is that it fosters communication between learners. Social interaction plays an essential role on the learning process. To promote social interaction in a classroom context the teacher should motivate students to inquire and participate – which will enhance the need of collaboration by assessment and feedback; try to focus students' attention; and try to make students externalize their internal thinking.

4. ISSUES OF M-LEARNING

There are three factors that need to be in place for a platform of this nature [using mobile devices in education] to scale in new emerging markets across the developing world:

The Infrastructure – all mobile devices need to be powered up. There's little access to grid power and green energy is expensive in many parts of the developing world. That said, a family has to decide whether to use the little money they have for a solar pack to power a (probably donated) mobile devices or buy food. Distributing mobile devices at a huge cost to taxpayers in developed and developing countries is the easy part. Once the device is powered up there's a need to download content onto it. While mobile penetration and coverage is pretty good in some parts of the developing countries, the same isn't true of other parts. The danger of mobile devices in developing countries that can't be powered up and onto which no content can be downloaded would seriously undermine any efforts.

The Technology - Mobile devices have come a very long way, very fast. However, I am yet to see one that can take the punishment of a school child's school bag, dust and fluid damage. M-Edge <source: http:// www. medgestore.com/> has made admirable attempts but theirs is a retrofit solution. I would love to see devices that are built from the ground up to be rugged. Devices that are not designed for the realities of rural developing

countries need to be replaced or repaired extremely often. This is really just a design challenge that can be easily overcome but one that needs research to solve properly.

Content & Curators - publishers in developing countries have been characteristically suspicious of digital publishing and content for these platforms are hard to get. However, getting content created or ported to this platform and distributed somehow is probably the easy part. How do the teachers (the curators) use the technology to help children learn better? Not enough attention is being paid to this and yet this seems the only way to keep this kind of technology going. And again teachers become the focal point of this technology. In some countries, it might be mobile devices that become the preferred platform. While exploring the potential to use the technology, we need to ensure teachers can teach best with whatever technology they have to use wherever they are. Who knows what new device or platform will evolve into the next pen and paper? Teachers will be still here, invest in technology that helps them become better at teaching.

5. PEDAGOGICAL CONSIDERATIONS

M-learning has started to emerge as potential educational environments and supporting tool in education process. These devices have been utilized to promote individual and collaboration among students in their education activities. The mobile devices such as mobile phones are well advanced nowadays which provide opportunity for education institutes to enhanced tool.

The main pedagogical issue to consider is the suitability of a course to the mobile learning environment. Not all courses are suited to the mobile learning environment. Purely of technical and very practical courses are not suitable. However, short courses and mainly theory and information type courses are suited to the mobile learning environment. The learning environment can be enhanced by the use of quizzes to test knowledge, summary of main learning points, and interaction with other students and the tutor via telephony integration

6. CONCLUSION

The ubiquitous learning environment (ULE) evolves more on perspective data than E-learning. Besides the domains of E-Learning, U-Learning may use more perspective understanding to provide most adaptive contents for learners. M-learning application based on 3G mobile devices nicely fits into U-Learning model. Education is happening all around the student but the student may not even be aware of the learning process in the ULE.

A sample range of platforms are available to choose to develop M-learning applications. The Ubiquitous Learning environment emphasizes the learner-centric curriculum and content. Among the ample range of choices the open-source nature and rich user interface that even supports sensor hardware and multitasking makes Android a desired platform for designing m-learning application.

Mobile learning is about being able to learn wherever and whenever you have a need or curiosity and to integrate that knowledge with other learning experiences. For being accessible from virtually anywhere, learners can engage in a more enriching, captivating, and fun experience than traditional tuition.

REFERENCES

- ✓ Shanmugapriya m, Dr Tamilarasi a "*Designing an m-learning application for a ubiquitous learning environment*", Indian Journal of Computer Science and Engineering ISSN 0976-5166 Volume: 2, Issue: Start page: 22; Date: 2011;
- ✓ Boja, C. L Batagan, (2009) "*Analysis of M-Learning Applications Quality*," WSEAS Transactions on Computers, Issue 4, Vol. 8, ISSN 1109-2750, pp. 767-777.
- ✓ Alier, M., Casany, M., & Casado, P. (2007). "*A Mobile extension to a web based Moodle virtual classroom*". In P.Cunningham & M. Cunningham (Ed.), Expanding the Knowledge Economy: Issues, Applications, Case Studies:Vol. 4 (pp. 1169-1176).
- ✓ Paul Pocatilu and Catalin Boja- **"***Quality characteristics and metrics related to m-learning process*", Bucharest Academy of Economic Studies, Romania.
- ✓ A.S Atkins, AK.H.N. Ali and Shah, "*Extending E-business application using mobile technology*", Proc of 3rd International Conference on Mobile Technology, Application and System
- ✓ C. C. Tsai, G. Lee, F.Raab, G. J. Norman, T. Sohn, W. G. Griwold and K. Patrick, Usability and Easibiliy of PmEB: "*A mobile phone application for monitoring real time caloric balance*" ,Mobile Network Application, Springer, 2007, vol.12, pp 173-184.

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SCREENING EFFECT IN (CdNi)S SOLUTION GROWN THIN FILMS

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Abstract:

Structural property of CdS and Ni doped CdS thinfilms deposited on glass substrate by chemical bath deposition (CBD) using cadmium chloride and nickel chloride as cationic and thiourea as anionic source with complexes EDTA, ammonium chloride and ammonium hydroxide is reported. The structural study was carried out using X-ray diffractometry (XRD). The X-ray diffraction reveals that the pure CdS films are in cubic phase and the Ni doped CdS films are nanocrystalline in nature with mixed cubic and hexagonal phase due to Ni_2S and CdS lattice. We report the deposition and optimization of the growth parameter with respect to dopant which showed that the composition verified from the extended Vegard's law are highly dependent on dopant concentration.

Keywords: EDTA, crystallite size, mixed phase, hexagonal, Vegard's law

INTRODUCTION

In electrosynthesis of ternary alloys several groups have identified screening effect due to completion of ions for sites. The competitions make some ions competing for metallic sites and prevent the other ion from reaching the substrate. In this film such a condition may associate with ionic mobility, ionic radii and atomic radius. In electrosynthesis the electric field is responsible for the mobility of ions [1, 2]. However in chemical bath deposition only diffusion of electrons associated with stirring is present and hence may not be easier to determine its presence [3]. The composition of the ternary film is also calculated using extended Vegard's law [4]. In this work structural studies on (CdNi)S thinfilms are investigated and the results are presented.

EXPERIMENTAL

The deposition of CdS thinfilms were carried out on sonicated cleaned glass substrate. For CBD, the composition of the bath was maintained with 7.5ml of 0.2M $CdCl_2.2H_2O$, 10ml of 0.1M NH_4Cl, 7.5ml of 0.5M $CS(NH_2)_2$, 25ml of 2M NH_4OH and 10ml of 0.6mM EDTA. For preparing of Ni doped films of various compositions, ratio of 0.2M $NiCl_2.5H_2O$ and $CdCl_2.2H_2O$ is varied as suitably. Deposition was carried out at the constant bath temperature of 80 ºC.

All the experiments were maintained for 60 mins. An X-ray diffractometer system [X'PERT PRO PANalytical, Netherlands] with CuKa radiation (l = 0.1540) nm was used to identify the crystal structure of the particles. The proposed overall mechanism for the deposition of CdS is shown below.

$$CdCl_2 + (NH_2)_2CS + 2OH^- \rightarrow$$
$$CdS + H_2CN_2 + 2Cl^- + 2H_2O$$

All the films were dark yellow in in color. The structural, optical and magnetic characterizations of $Cd_{1-x}Ni_xS$ were done the range of methods.

RESULTS AND DISCUSSIONS

The XRD patterns of undoped and Ni doped CdS nano thinfilms are shown in fig. 1. They exhibit cubic structure and are identified as per the standard JCPDS card no. 89-0440. The 2θ values of the diffraction peaks are observed at 26.46º, 43.89º and 51.97º which corresponds to reflections from (111), (220) and (311) planes for undoped and Ni doped CdS thinfilms. With increasing Ni concentration, the (111) peak shift to lower angle which indicates the increased lattice parameter in $Cd_{1-x}Ni_xS$ (X = 0.06 and 0.08) thinfilms. The shift may be associated to the presence of dopant (Ni) contents (or) it was aroused due to the lattice contraction in nano structure. The hexagonal based peaks appeared in Ni doped CdS films which were indicated by astricks (*).This means that the excess of Ni and S ions were formed Nickel sulfide CdS lattice has reached

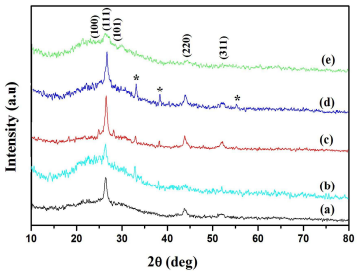

Fig. 1. X – ray diffraction pattern of $Cd_{1-x}Ni_xS$ thinfilms obtained at various Ni concentrations (a) X = 0, (b) X = 0.04, (c) X = 0.06, (d) X = 0.08 and (e) X = 0.1M.

its solubility limit at X=0.08M. The precipitates were formed in the higher concentration of Ni above than X=0.08, which affects the crystalline nature of CdS film. The average crystallite sizes are calculated using Debyes Scherrer formula

$$D = \frac{k\lambda}{\beta Cos\theta}$$

Where λ is the wavelength of X-rays, θ is the Bragg diffraction angle, ß is the FWHM of the XRD peak corresponding to the Bragg diffraction angle 2θ and D is the crystallite size. The strain (ε) was calculated using the relation

$$\varepsilon = \frac{\beta cos\theta}{4}$$

Ni concentration	Interplanar distance – (d) (A°)		Lattice constant – (a) (A°)		Crystallite size (nm) (D)	Strain (ε)
	Observed value	Calculated value	Observed value	Calculated from Vegard's law		
0	3.3658	3.3668	5.8299	5.8332	11.13	3.37
0.02	3.3638	3.3642	5.8239	5.8269	11.82	3.21
0.04	3.3611	3.3627	5.8243	5.8239	12.44	3.23
0.06	3.3608	3.3610	5.8217	5.8208	14.66	3.09
0.08	3.3586	3.3592	5.8138	5.8178	29.06	1.27
0.1	3.3572	3.3558	5.8139	5.8147	40.23	1.04

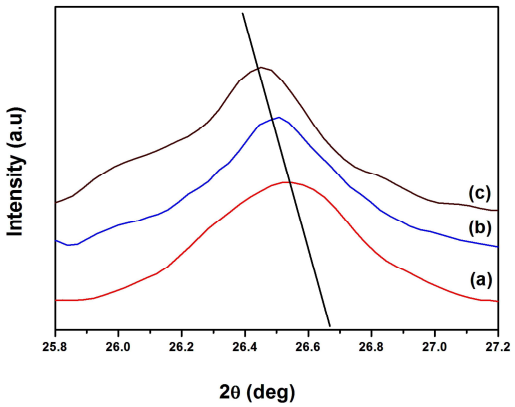

Fig. 2. The magnified view of X – ray diffraction pattern of Cd1-XNiXS thinfilms obtained at various Ni concentrations (a) X = 0, (b) X = 0.06 and (c) X = 0.08M.

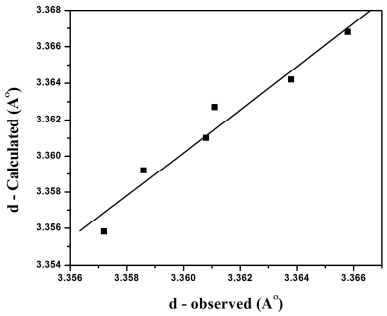

Fig. 3. The observed and calculated d - values for $Cd_{1-X}Ni_XS$ thinfilms (X = 0 to 0.1M)

Fig. 3 shows the observed and calculated inter planar distance (d) of undoped and Ni doped CdS thin films. The straight line is the linear fit line of the d – values. For the binary compounds, Vegard's law has been used widely to estimate composition of solid solutions from diffraction data [5], consider two elements A and B, its alloy A_xB_{1-x}, where x is alloy composition. Assume that A has lattice constant a^A and B has lattice constant a^B, then the lattice constant of the alloy by the simplest mathematical expression for Vegard's law for a binary solid solution A-B is:

$$a = (x)\ a^A + (1-x)\ a^B$$

The calculated lattice constant from Vegard's law, variation of crystallite size (D) and strain (ε) values of undoped and Ni doped CdS thinfilms with respect to Ni concentration are reported in table 1. The crystallite size gradually increased from 11nm to 40nm with the increased Ni concentration. The strain gradually decreased with respect ot increased Ni content that the strain values decreased due to the increased crystallite sizes [6].

Conclusion

Undoped and Ni doped CdS thin films were deposited onto non conducting glass substrate using chemical bath deposition technique. The pure CdS films are in cubic phase and the Ni doped CdS films are mixed cubic and hexagonal phase due to Ni_2S and CdS lattice. The lattice structure and

crystallite size of CdS films increased and also which starts to changes from cubic to hexagonal phase with the increased Ni concentrations. The composition of (CdNi)S are also verified from the Vegard's law.

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References:

[1] Y. Li et al., J. Mater. Chem. 15 (2005) 917.

[2] H. Liang, T. E. Angelini, P.V. Braun, G.C.L. Wong, J. Am. Chem. Soc. 126 (2006) 14157.

[3] E. Cetinorgu, C. Gumus, R. Esen, Thin Solid Films 2 (2006) 1688-1693.

[4] L. Vegard: Z. Cryst. 67 (1928) 239.

[5] N. Nishiyama, J. Lin, A. Okazaki, M. Iwasaka, K. Hirakawa: Jap. J. Appl. Phys. 29 (1990) 369-371.

[6] E. Cetinorgu, C. Gumus, R. Esen, Thin Solid Films 2 (2006) 1688-1693.

SCREENING, PRODUCTION AND PARTIAL PURIFICATION OF LACCASE ENZYME FROM WHITE ROT FUNGI

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ABSTRACT : *Laccase are ligninolytic enzymes of wood rot fungi directly involved in degradation of lignin in their natural lignocellulosic substrates. Structurally, laccase belongs to the family of blue multi-copper oxidase (MCOS) that has three-domain structure and usually contains four copper atoms. This enzyme exists widely in plants, fungi and recently some bacterial laccase have also been characterized, where it is often associated with lignin peroxidase, manganese dependent peroxidase or both. It supports the degradation of various xenobiotic compounds and has emerging application in production of biosensors and biofuel cells. Wood decay fungi falls in to three types according to their mode of attack on the woody cell wall, soft rot, brown rot, and white rot fungi. Almost all species of white rot fungi were reported to produce laccase. An attempt was made to screening, production and partial purification of laccase enzyme from white rot fungi. The wood decay fungi sample were screened for laccase positive production by plate test method using the indicator compound Guaiacol. Positive fungal strain was cultivated by submerged fermentation using two different medium (Natural and synthetic medium). Guaiacol and acetate buffer were used to assay laccase production during submerged fermentation. By using Lowry's method total enzyme concentration in the both media was estimated. The produced enzyme was partially purified and its molecular weight was analyzed by SDS PAGE. Screening work result in the isolation of positive fungal strain and the enzyme production was found to be higher in natural medium (870µg/ml) when compared to synthetic medium (500µg/ml). Finally, the enzyme was immobilized for future work.*

Key words

Multicopperenzyme, White rot fungi, Benomyl, Guaiacol, Submerged fermentation, SDS-PAGE.

Introduction

Laccase are multicopper enzymes that belong to the group of blue oxidases. Structurally, laccase belongs to the family of blue multi-copper oxidase (MCOS) that has a three-domain structure and usually contains four copper atoms (Nakamuru and Go,2005; Hoegger et al., 2006) Multi-copper oxidases are characterized by three spectroscopically different copper binding sites T1 with one copper atom, T2 also one copper atom and T3 contain two copper atoms. T2 and T3 organize in to a single copper cluster. Two histidine and one cysteine serve as ligand for copper at T2/T3 cluster.serve as ligand for copper at T2/T3 cluster. The mononuclear T1 is the primary site of electron acceptance from the substrate. Electrons are further transferred to the trinuclear cluster T2/T3 which serve as the dioxygen binding site and reduces molecular oxygen upon receipt of four electrons under formation of water (Kuesand Ruhl,2011). Laccase oxidizes wide variety of organic and inorganic

compounds, including diphenols, polyphenols, substituted phenols, diamies and aromatic amines (Thurston,1994). Laccase exists widely in plants, fungi and recently some bacterial laccase have also been characterized from *Azospirillumlipoferum, Bacillus substilis, Streptomyces lavendulae and Streptomyces cyaneus* (Kiiskinen et al,2004). The occurrences of laccase in higher plants are limited when compared to fungi. Laccase in plants are identified in trees, cabbages, turnips, beets, apples, asparagus, potatoes,pears and various other vegetables. Initially laccase discovered in Japanese lacquer trees, is a member of the Anacardiaceae family, contain laccase in the resin ducts and in the secreted resin. . They are mainly found in fungi, especially from white rot fungi. Laccase can (directly or indirectly) cleave a significant proportion of the structures found in lignin, the role of laccase in ligninolysis remains unresolved, but the widespread occurrence of this enzyme in wood rotting fungi is unlikely to be coincidental.

In laccase-mediated reactions, diphenolic compounds undergo a four-electron oxidation. During this reaction, Cu (II) is reduced to Cu (I). In the next step in the reaction, Cu (I) reduced molecular oxygen (O2) to produce two molecules of water. During this reaction (I) is oxidized back to cu (II) (Thurston,1994). In plants, laccase plays a role in lignifications whereas in fungi it has been implicated in delignification, sporulation, pigment production, fruiting body formation, and plant pathogensis. In the fungi Ascomycetes and Deuteromycetes are not been clear focus for lignin degradation studies as much as the white rot Basidiomycetes. A wood decay fungi is a variety of fungus, it digests moist wood and causing it to rot. Some wood decay fungi attacks dead wood, such as brown rot fungi which not only grows on wood but actually causes it to decay, which are called lignicolous fungi. Wood decay fungi are classified based on the type of decay that cause. They are brown rot, soft rot, and white rot fungi. Brown rot fungus breakdowns hemicellulose and cellulose. Cellulose is broken down by hydrogen peroxide (H2O2) that is produced during the break down of hemicellulose. Because hydrogen peroxide is a small molecule, it can diffuse rapidly through the wood, leading to decay that is not confined to the direct surroundings of the fungal hyphae. As a result of this type of decay, the wood shrinks, shows a brown discoloration and cracks in to roughly cudical pieces; hence the name brown rot or cubical brown rot (eg*Serpulalacrymans*). Submerged fermentation techniques are common and conventional biotechnology process in view of production of value added products such as enzyme, biopharmaceuticals, organic acid, biosurfactant, vitamin, flavoring compounds, biofuels, biopesticides etc. Laccases was generally produced in low concentrations by laccase producing fungi, but higher concentrations were obtained with the additionwith the addition of various supplements to media. The additions of aromatic compounds such as 2, 5-xylidine, lignin, and Veratryl alcohol increase and induce laccase activity. Ammonium sulphate is being commonly used for the enzyme purification for many years. But nowadays several efficient methodologies are developed such as protein precipitation by ammonium sulphate, anion exchange chromatography, desalt/buffer exchange of protein, and gel filtration

chromatography. Single-step laccase purification from *Neurosporacrassa*takes place by using celite chromatography and fold purification was obtained with specific activity of 333 U mg−1. The molecular mass of the monomer ranges from about 50 to 100KDa. An important feature is covalently linked carbohydrate moieties (10-45% of total molecular mass) contribute to high stability of laccase. Molecular weight of laccase is 64.8KDa. Purified Lac IId (isoforms of laccase from cerena unicolor) shows a molecular weight of 59 KDa and PI OF 5.3 when analysed by 2-D PAGE. Purified laccase enzyme from *Trametesversicolor*with a molecular mass of approximately 97KDa as determined through SDS-PAGE, larger than those of other laccases is reported.

Materials and Methods

Collection of sample

The sample was collected from natural habitat such as decaying wood from Berijam forest, Kodaikanal.

Isolation of white rot fungi

1gram of the collected sample was added to 10 ml of sterile distilled water and mixed. This suspension was serially diluted from 10 -1 to 10-7. Later, 1.0 ml of each dilution was spread on the surface of Potato dextrose agar which is contains 0.01% Chloramphenicol and Benomyl, using an L Shaped glass rod and incubated at 30for 7days.

Screening of laccase producers

The fungal strain was inoculated in Potato dextrose agar plate which is contains 0.01% Guaiacol and it was incubated at 30 for 7days. After incubation the plates were observed for the formation of reddish brown zones around the colony. It was taken as the positive reaction for the presence of laccase enzyme activity (kumar et al,2012).

Production by submerged fermentation

Fungal strains showing positive reaction in the plate test screening were grown in yeast extract medium (27.5g-1 yeast extract, 25gl-1 glucose and minerals (synthetic medium)) by submerged fermentation. While the same medium, with wheat bran (Natural medium) concentration of 25g-1 instead of glucose, was used as the lignocellulosic growth substrate. Inducers are also added to the liquid cultures: 0.05% Tween 80. The microbes were cultivated in 250ml Erlenmeyer flask at 30 on a rotary shaker (100-150 rev min -1). At desired intervals, growing culture of fungal strain was withdrawn aseptically and monitored for laccase activity.

Assay of laccase activity

Enzyme activity was determined using Guaiacol as the substrate. For these assay two test tubes were taken. To 1ml of 10mM Guaiacol about 3ml of 100mM acetate buffer was added to both the tubes.1ml of culture filtrate was added to any one of the tube which was taken as test to give final reaction volume of 5ml. The tube without culture filtrate was taken as blank. Absorbance for blank was measured at 470 nm while the test sample was measured at 530 nm. The change in the absorbance of reaction mixture with Guaiacol was monitored for 10 minutes of incubation. The enzyme activity was measured in u/ml, which is defined as the amount of enzyme catalyzing the production of colored product per min per ml (Jhadav et al,,2009).Where, Vt = final volume of reaction mixture (ml) = 5.00 Vs = sample volume (ml) = 1 € = extinction co-efficient of guaiacol = 6,740 /M/cm 4 =

was derived from unit definition & principle

Partial Purification of laccase

After submerged fermentation, the crude fungal culture was filtered through whatman No 1 filter paper. Then the protein solution was taken in beaker with magnetic bar and it was placed in an ice bath or at 4ºC on a stirrer. 0.6g of ammonium sulphate per milliliter of protein solution was taken. Then the protein solution was stirred and small portion of ammonium sulphate was added to it and it was allowed to dissolve before adding next portion. Finally the beaker was allowed to stand overnight (Patrick et al, 2009).

Estimation of laccase by Lowry's method

Pipetted 0.2 ml of working standard in a series of test tube and all the tubes were made up to 1ml using distilled water. Blank containing 1ml distilled water was also taken. 0.5ml of test solution in a test tube was taken and this was also made up to 1ml with distilled water. 5ml of alkaline copper reagent (Reagent c) was added to all the test tubes and kept for 10mins at room temperature. Then 0.5ml of FolinsCiocalteau reagent was added to all the tubes mixed well and incubated at 37 in dark for 30 minutes. The blue color developed was read at 660nm. A standard graph was plotted with concentration of BSA on X-axis and optical activity on Y-axis (Minussi et al, 2007).

SDS Poly Acrylamide Gel Electrophoresis of laccase enzyme

Casting of gel

Two glass plates were assembled with spacers on three sides and it was sealed with agar. Water was poured in the gap between the glass plates to check for leakage. Separating gel was prepared and poured in the gap and allowed to polymerize by adding a layer of water –saturated n-butanol on top. This was followed by preparation of stacking gel and poured above the separating gel after decanting water. A comb was inserted and allowed to polymerize.

Sample preparation

To the sample containing 10, 20 and 30µg of protein, equal volume of 2x sample buffer was added, vortexed and heated in a boiling water bath for 1-2 minutes and cooled to 25.

Running of gel

The polymerized gel was assembled in electrophoresis tank. Electrophoresis buffer was added to the top and bottom of the tank. Then it was connected to the power pack and electrophoresis was carried out at 50volts.

Commassie brilliant blue

The power supply was turned off; The gel mould was removed from the apparatus, and the plates were separated using a spatula. The orientation in the gel was marked.

Immobilization of laccase enzyme

Sodium alginate slurry was prepared by adding 5.5g sodium alginate to 150ml of 0.1% sodium chloride solution with continuous stirring. The slurry was allowed to stand for 6-8hours. To this 15ml of enzyme solution was added. The bead was prepared by controlled drop wise addition of slurry to the 4% calcium chloride solution. The beads were kept in calcium chloride solution about 30minutes for gelation.

Result

Isolation of White Rot Fungi

White rot fungi was isolated from the sample collected from natural habitat (decayed wood) from Berijam forest, Kodaikanal (Figure.2). It was serially diluted and cultured on Potato Dextrose Agar containing Benomyl and

Chloramphenicol. White mycelial pad was observed after incubation showing the indication of fungal growth.

Screening of Laccase Producers

Laccase producing fungi was confirmed using PDA media containing guaiacol as indicator compound. A reddish brown colored zone was observed around the colonies after incubation (30oC). The maximum zone formed isolate (ABKF1) was used for enzyme production.

Culture Condition and Laccase Activity

The screened fungus culture was sub cultured on to two different medium containing a natural source (Wheat bran) and an artificial source (Glucose) respectively and incubated for seven days to reach a maximum yield of enzyme and its enzyme activity was assayed on three different days. It was observed that on fifth day the optical density was measured to be 0.536 for wheat and for glucose 0.30. On sixth day 0.87 for wheat and 0.41 for glucose. Finally on seventh day it was observed that 1.16 and 0.47 for wheat and glucose respectively. The enzymatic activity was calculated using these readings on three days. Among this three days the maximum enzymatic activity was detected on seventh day (wheat 2.77 unit/mole and for glucose 1.17 unit/mole).

Partial Purification of Laccase

The laccase extracted from both natural and synthetic medium was partially purified by salt precipitation method using Ammonium sulphate. After this treatment, a clear protein solution was observed.

Estimation of Laccase

Partially purified laccase was estimated by Lowry's method in which Bovine serum albumin was used as standard and the total yield of laccase enzyme in natural and synthetic media was estimated as 850 µg/ml and 500 µg/ml (Figure. 2)

SDS PAGE

The molecular weight and efficiency of the purification were analyzed on 10% SDS PAGE and the gel was run at 150 volt for 1hour, the gel was stained with Commassie Brilliant Blue. The bands were observed and its molecular weight were determined (66 KDa). (Figure. 8)

Immobilization of Laccase Enzyme

Partially purified laccase enzyme was immobilized by gel entrapment method using sodium alginate and calcium chloride. The immobilized beads were stored in 0.9% saline for future use.

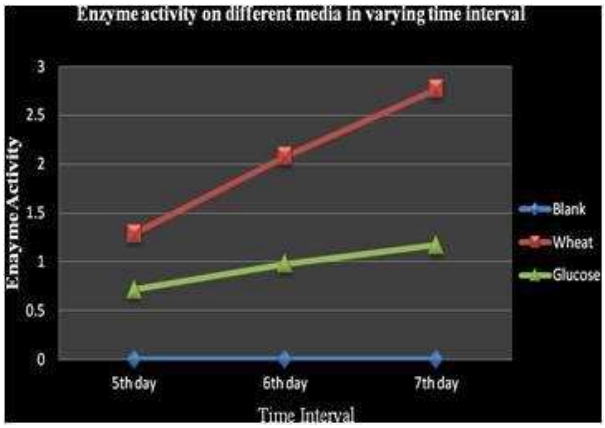

Figure1. Enzyme activity on different media at varying duration

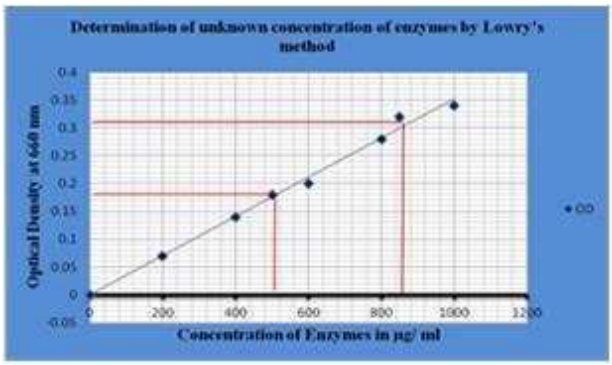

Figure 2. Determination of unknown concentration of enzymes by Lowry's method

Discussion

For this current research work, wood decay fungal sample was collected from Berijam forest, Kodaikanal. The collected sample was cultured,potato dextrose agar media was supplemented with Benomyl and Chloramphenicol. Particularly Benomyl was used to select wood decay fungi and Chloramphenicol was used to inhibit the unwanted bacterial growth. The same procedure was carried out earlier by Kiiskinen*et al,* (2004); they also used Benomyl and Chloramphenicol on PDA media for selecting wood decay fungi. Among wood decay fungi, particularly white rot fungus was identified through direct morphological identification. The isolated white rot fungi were screened for laccase production on PDA media supplemented with Guaiacol. If the isolated white rot fungus produces laccase, it catalyzes the oxidation of Guaiacol to form reddish brown color in the medium. This confirms the positive strains (ABKF1). Similar method was used by Vinoth Kumar *et al.* in 2011 where they used Guaiacol and syringaldazine for screening laccase producers. They observed reddish brown color zone around the colonies in the presence of Guaiacol on PDA media and pale yellow zone in the presence of syringaldazine. According to Kiiskinen*et al,* (2004) they produce laccase enzyme by cultivating positive fungal strain in soya meal medium and yeast extract medium. They added Tween 80, Veratryl alcohol, Indulin and Guaiacol as inducer to increase the laccase production. Finally they obtained maximum production in the period of seven days. Likely in our study the maximum production was attained in seven days. In this present study the positive fungal strain (ABKF1) was cultivated by submerged fermentation using two different media: natural (Wheat) and synthetic media (Glucose). Laccase production from these two media was compared. In both the media only the carbon source was changed as in natural media wheat bran was added as a carbon source and Glucose was added as a carbon source in synthetic media. In this study, wheat bran was selected as a natural source, since it was a cheapest carbon source and they can induce the increased laccase production. During submerged fermentation, at regular intervals of time laccase enzyme was extracted aseptically from both natural and synthetic media. By using Guaiacol and acetate buffer enzyme activity was measured in u/ml which is defined as the amount of enzyme catalyzing the production of one micromole of colored product per min per ml. As a result of this assay laccase production was found to be higher in natural media (2.77U/ml) when compared to synthetic media (1.77U/ml). The previous reports suggest that Guaiacol and acetate buffer could be used for estimating enzyme activity (9). They have used several sources for laccase production, in that Guaiacol shows higher laccase activity. Before and after purification the laccase activity in Guaiacol media was found to be 0.44U/ml and 0.27U/ml. When this result was compared to our result, natural media (wheat bran) showed increased laccase activity than carbon and Guaiacol source. In the present study, produced crude enzyme was partially purified by using ammonium sulphate. After this treatment the clear solution was obtained. Thus the partially purified laccase enzyme was

analyzed by SDS PAGE; as a result of this a single band was observed. According to Ferdinand Patrick *et al,* (2009), they have used several methods to purify the crude protein sample; they were desalting /buffer exchange of protein, anion exchange chromatography and gel filtration chromatography for purification. Finally they analyse the purified laccase by SDS PAGE using marker, as a result of this they have got single band with the molecular weight of 65kDa. Ammonium sulphate was commonly used because it is less expensive and easy to use. As a result of Lowry's method, total concentraction of protein was found to be high in natural media (87mg) when compared to synthetic media (46mg). The standard curve was drawn based upon the optical density values measured at 660nm in which BSA was used as standard. The protein react with copper in an alkaline medium and the Phosphomolybdate present in Folin'sCiocalteau reagent react with aromatic amino acids such as tyrosine and tryptophan, reduces phosphomolybdate to a blue color which as sharp absorption maximum of 660 nm. The intensity of the color depends on the amount of these amino acids present. Finally the laccase enzyme was immobilized using Sodium alginate and Calcium chloride. Sodium alginate and Calcium chloride undergo polymerization resulting in formation of beads. This bead was stored in 0.9% saline for future use. Laccase is important because it oxidizes both the toxic and nontoxic substrates. It is utilized in textile industry, food processing industry, wood processing industry, pharmaceutical industry, and chemical industry. This enzyme is very specific, ecologically sustainable and a proficient catalyst. Due to rapid industrialization and extensive use of pesticides for better agricultural productivity, contamination of soil, water, and air take place which is a serious environmental problem of today. In beer industry, laccase not only provides stability but also increases the shelf life of beer. In beer, haze formation takes place which is stimulated by the naturally present proanthocyanidins polyphenol and is referred to as chill haze. At room temperature or above, warming of beer can redissolve the complex.

Conclusion

Laccase producing white rot fungus was identified by using Guaiacol. An attempt was made to increase the production of laccase by using two different media (natural media and synthetic media). As a result of these natural media (870 µg) showed increased production when compared to synthetic media (500 µg). Finally the molecular weight of laccase enzyme was found to be 66 KDa.

Reference

1. Couto, S.R. and Toca Herrera, J.L. 2006. Industrial and biotechnological application of laccase: a review. Biotechnology advances.24:500-513.

2. Ferdinandi Patrick, God living Mtui, Anthony ManoniMshandete, Gunnar Johansson and Amelia Kivaisi. 2009. Purification and characterization of a laccase from the basidiomycete*Funaliatrogii*(Berk .) isolated in Tanzania. African Journal of Biochemistry Research .3 (5): 250-258.

3. Hoegger, P.J., Kilaru, S., James, T.Y., Thacker, J.R. and Kues, U. 2006. Phylogenetic comparison and classification of laccase and related multicopper oxidase protein sequences. FEBS J.273:2308-2326.

4. Jhadav ,A., Vamsi, K.K., Khairnar, Y., Boraste, A., Gupta, N., Trivedi ,S., Patil, P.,Gupta, G., Gupta, M., Mujapara, A.K., Joshi, B., Mishra ,D.2009.Optimization of production and partial purification of laccase By Phanerochaetechrysosporium using submerged fermentation. International Journal of Microbiology Research. 1:09-12.

5. Khammuang, S. and Sarthima, R.2009. Laccase activity from fresh fruiting bodies of Ganoderma sp.MKO5: Purification and remazol brilliant blue R decolorization.Journal of Biological science.9:83-87.

6. Kiiskinen, L.L., Ratto, M. and Kruus, K. 2004. Screening for novel laccase-producing microbes .journal of Applied Microbiology. 97:640–646.

7. Nakamuru, k. and Go, N. 2005. Function and Molecular evolution of Multicopper blue proteins.Cell.mol.Lifescince. 62:2050-2066.

8. Perry, C.R., Matcham, S.E., Wood, D.A. and Thurston, C.F. 1993. The structure of laccase protein and its synthesis by the commercial mushroom *Agaricusbisporus*.J.Gen. Microbiol.139:171-178. Thurston, C.F. 1994. The structure and function of fungal laccase .Microbiology.140:19-26. Ursula kues and Martin Ruhl. 2011. Multiple –Copper Oxidase Gene Families in Basidiomycetes-What for? Current Genomics1.2:72-94.

MOBILE BROADBAND SERVICES IN INDIA & ITS FUTURE

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Abstract

This paper examines the potential for Mobile Broadband Services, its impact on the telecom industry and other allied sectors in India. This paper focuses on the India growth story and the role telecom has played in infrastructure growth in India. Further, it looks at the current and future telecom industry scenario and why mobile broadband is the way forward. Mobile broadband is about more than enhanced application and network performance; it is also a catalyst for business-model innovation, driving change in the way services are delivered as well as revenues generated. The paper looks at how mobile broadband will change the existing business dynamics within the telecom sector and the impact in terms of revenue, investment and employment between 2010 and 2015. Finally, the report identifies the key enablers for uptake of mobile broadband services in India. In telecommunications, 4G is the fourth generation of mobile phone mobile communications standards. It is a successor of the third generation (3G) standards. A 4G system provides mobile ultra-broadband Internet access. (ie) laptops with USB wireless modems, to smart phones, and to other mobile devices. Conceivable applications include amended mobile web access, IP telephony, gamingservices, high-definition mobile TV, video conferencing and 3D television.

INTRODUCTION

Mobile broadband is the term for wireless internet access used by mobile phone, USB wireless modem, portable modem and other
mobile devices. It supports data, voice and video communications.

Ever since the population started increasing, human beings wished to communicate in the easiest and quickest way without navigation. The journey of mobile internet access started from the 19th century with 1st generation mobile technology has reached the 4th generation.

Now a days, in India many mobile technologies available such as 2G, 3G, 4G, WiMAX, Wibro, EDGE, GPRS, CDMA, HSPA, HSPA+, GSM, etc., These technologies provides broadband services in the following mobile computers.

- Pc data cards or connect cards
- USB modems
- USB flash drives also known as "dongles"
- Smart phones, notebooks, net books with built in support for mobile broad band.

INDIAN SERVICE PROVIDERS

Every ten years new mobile phone technology and infrastructure are involving a change in fundamental nature

of service, higher peak data rates, new frequency bands, wider channel frequency bandwidth in hertz. These transitions are referred to as generations.

After first generation the 2G technology was started in 1991 with first mobile data service. The third and fourth generation commenced from 2001 and 2006 respectively.

Rank	Operator's Name	Technology	Subscribers (in millions)
1	Airtel	GSM, EDGE, HSPA, TD-LTE	185.92 (September 2012)
2	Idea Cellular	GSM, EDGE, HSPA	115.66 (September 2012)
3	Reliance Communications	CDMAONE EVDO, GSM, HSPA, WiMAX	154.11 (September 2012)
4	Vodafone	GSM, EDGE, HSPDA	152.46 (September 2012)
5	BSNL	GSM, HSDPA, HSPA+, WiMAX, WiFi, EVDO, CDMAONE	96.28 (September 2012)
6	Tata DoCoMo (GSM& CDMA) Virgin Mobile (GSM & CDMA) Talk24/T24 (GSM)	CDMA, EVDO GSM, EDGE, HSPA+	87.83 (October 2011)
7	Aircel	GSM, EDGE, HSPA,	66.60 (September 2012)
8	Uninor	GSM, EDGE	42.14 (September 2012)
9	MTS	CDMA, EVDO	14.01 (October 2011)
10	Videocon	GSM, GPRS, EDGE	4.45 (September 2012)
11	MTNL	GSM, HSDPA, CDMA	5.10 (September 2012)
12	Loop Mobile	GSM, EDGE	3.02 (September 2012)

SERVICES IN INDIA

3G Technology

3G technologies make use of TDMA and CDMA. This technology make use of services like mobile television, GPS (Global Positioning System) and video conferencing. The basic feature of 3G technology is Fast data transfer rates. It is expected that 2mbit/sec for stationary users, while 348kbits when moving or travelling. The five radio technologies operate under CDMA, TDMA and FDMA. CDMA holds for IMT-DS (direct spread), IMT-MC (multi carrier). FDMA has only one radio interface known as IMT-FC or frequency code. Third generation technology is really affordable due to the agreement of industry. This makes to increase in adoption by the users The main objective of 3G is to allow more coverage and growth with minimum, investment.

3G is the gateway of mobile application and clarity of digital signals. It was able to transfer circuit switched data to packet switched data over network increased bandwidth. It offers many multimedia services. It is also known as IMT-2000. The technologies are GSM, EDGE, UMTS, WiMAX, CDMA, etc.,. EDGE is the extension of GSM and also used for faster data transfer the GSM. It is three times better than GSM.UMTS is the Universal Mobile Telecommunication System. It offers complex network and allows for radio access and core network. WiMAX is a wireless technology, that transmits variety of wireless signal. It can be operated on multipoint and point modes. It is portable technology used in microwaves.

4G Technology

It is a 4^{th} generation technology. It is the extension of 3G which provide data rates up to 100Mbps for mobile users and 1Gbps for station users.

4G offers much higher internet speed as compared to 3G. 4G technologies provide substantial level of improvement in performance and capabilities as compared to the 3G technology in terms of higher data rates. For example higher resolution video works better in 4G Technology in comparison to 3G.

BSNL has rolled-out WIMAX (Worldwide Interoperability for Microwave Access) based 4G services in the rural areas of Andhra Pradesh, Bihar, Orissa, Tamilnadu (including Chennai), Gujarat, Himachal Pradesh, Haryana, Jammu & Kashmir, Karnataka, Maharashtra, Madhya Pradesh, North East, Assam, Punjab, Rajasthan, Uttar Pradesh (East), Uttar Pradesh (West) and West Bengal (excluding Andaman & Nicobar) service areas, which also include the new states of Uttarakhand, Jharkhand and Chattisgarh. BSNL has also rolled out WIMAX (4G) services in the urban areas of Kelara and Punjab circles. Bharti Airtel Ltd. has launched 4G BWA services hazed on LTE (Long Term Evolution) technology in Kolkata service area.

The wireless broadband services have been rolled-out by BSNL. Despite its best efforts, MTNL could not find a partner for rollout of BWA services on Franchisee model (revenue sharing basis), company has written to Department for surrender of BWA spectrum.

TECHNICAL OVERVIEW

Global System for Mobile Communication (GSM)

GSM is a digital cellular system that means cell phones connect to it by searching regions in the vicinity. There are five types of cell sizes in GSM Network.

1. Macro Cells – base station antenna installed on average of roof top level of building.
2. Mini Cells - antenna installed on under average of roof top.
3. Pico Cells – It covers the region of a few dozen meters.
4. Femto Cells – It covers all over the World that means which provides broadband connection to homes.

Key Features of GSM

All 2G and 3G cell phones are having GSM in them. It provides many advanced 3G technologies like EDGE and UMTS and also offers international roaming.

- **GSM Carrier frequencies**
  The frequency ranges which includes 900 MHZ or 1800 MHZ bandwidth for 2G.
- **Voice codec's**
  It provides lot of voice codec's. It is mainly used for audio transmission which transfer data rates 6.5 and 13 Kbit/s in Half rate and Full rate respectively.
- **Subscriber Identity Module (SIM)**
  It is removable card which has phone book and caller's information. It allows user to get the information after changing handsets.
- **Phone Locking**
  Mobile user restricts handsets that they sell for use with their own network. This is called locking. Unlocking a phone without an operator's knowledge is crime in many countries.(eg. Singapore) But in Bangladesh, Brazil, Chile, Hong Kong, and India phones are sold unlocked.
- **GSM Service Security**
  It provides the pre-shared key and challenge–response techniques to protect the subscriber. UMTS provides USIM (Universal Subscriber Identity Module) which gives greater security for encrypted and decrypted keys. GSM uses many cryptographic algorithms such as A5/1, A5/2, A5/3 for air-voice security.

- **GSM Open Source Software**
  Several open source software projects are available. Such as gsmd daemon by Openmoko, OpenBTS develops a Base transceiver station

General Packet Radio Service (GPRS)

GPRS is an integrated part of GSM network. It is a packet oriented mobile service on 2G and 3G Communications for mobile. It provides data rates that ranges from 56 to114 kbit/second on 2G systems. It has the features like

- SMS messaging and broadcasting.
- "Always on" Internet access.
- Multimedia messaging service(MMS)
- Point-to-Point (P2P) service.
- Point to Multi-pointing (P2M) service.
- Instant messaging in village

Enhanced Data Rates for GSM Evolution (EDGE)

It is a digital mobile phone technology. It is an extended version of GSM. It is used for fast data transmission which is supported by 3GPP (3rd Generation partnership projects). It is also known as Enhanced GPRS (EGPRS), or IMT Single Internet connection. It mainly used for packet switched Internet connection.

It is 4 times better the GPRS. It submits proposals to the International Telecommunication Union (ITU) for 3G. This technology is used in Blackberry N97 and N95 mobile phones. It translates data in few seconds rather than GPRS.The main advantage of EDGE is it does not need any hardware and software to make use of this technology. It is the only technology to give multimedia.EDGE has been supported by following service providers such as Airtel, Idea Cellular, BSNL, Virgin Mobile, Aircel, Uninor, Videocon and Loop Mobile.

GSM needs some software and hardware setup to use this. But EDGE does not need. EDGE is three times faster than both GPRS and GSM technologies for data transmission.

High Speed Packet Access (HSPA)

It is a group of two mobile telephony protocols which includes High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA). It improves the 3G mobile technology and enhanced to HSPA+ in 2008.

It provides wireless broadband services. It's data rates up to 84Mbit/s in downlink and 10.8 Mbit/s in uplink and also accepts MIMO with Dual Cell technology.

- A shorter Transmission Time Interval (TTI).
- Fast scheduling
- MIMO (Multiple Input and Multiple Output).
- Link adaption for channel maximization

  In 2010, HSPA deployed by 200 operators in more than 80 countries.

Worldwide Interoperability for Microwave Access (WiMAX)

It's name is extracted from WiMAX Forum which was formed in 2001 for wireless broad band access. This provides data rates from 30 to 40 Mbit/s.The IEEE 802.11 standards now called "Fixed WiMAX" which is called "WiFi on Steroids". The IEEE 802.16 standards called WiMAX.

WiMAX Services

- Portable mobile broadband connection.
- Digital subscriber line (DSL) for "last mile".
- Provides Internet Protocol Television (IPTV) and Voice over Internet Protocol (VoIP).

It offers services in low cost compared to HSDPA, HSPA and 3G.

Long Term Evolution (LTE)

It is a new technology for fourth generations that focused to provide better quality of service compared to 3G and WiMAX.

It offers low cost for users and high data speed mobile wireless. By the end of 2009 most of the users accessed the GSM and CDMA (Code Division Multiple Access). Now a day it is also used by mobile wireless users.

The WiMAX uses microwaves for data transmission. But LTE uses radio waves for data transmission. This is the major advantage between these two.

Disadvantages

It is very expensive for setup of new network upgrades users when users need to buy a new mobile with new network setup.

CONCLUSION

Thus future 4G technology provides high data rates with UMTS, OFDMA, SDR, TD-SCDMA, MIMO and WiMAX techniques. It comes with its own network having clear 24 x 7 internet accessing. It is expected to be 20 times faster than 3G.

REFERENCES

http://www.FreeWiMAXInfo.com
http://www.BlackBerry.com
http://www.wikipedia.org.
http://www.airtel.co.in
http://www.bsnl.co.in

VERHULST MODEL FOR POPULATION GROWTH

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Abstract

The use of logistic growth model (Verhulst Model) is widely established in many fields of modeling and forecasting first order differential equation governs the growth of various species. If a given population is very large and it is suddenly increased by one then the change is very small compared to the given population thus to make the approximation that large population change continuously and even differentiable with time the projection of future population are normally based on present population. In this paper we determine the predicted population values in Thanjavur district using Verhulst model.

Introduction

To solve many problems faced by us, we need a technique and this is what is known as, mathematical modeling. It essentially consists of translating real world problems solving the mathematical problem and interpreting these solutions in the language of real world. Population growth is a dynamic process that can be effectively described using differential equations.

Malthusian Growth Model

Thomas Robert Malthus was the first economist to propose a systematic theory of population. Malthu's model is an example of model with one variable and one parameter; the variable is the population and the parameter is the population growth rate. This model reflects exponential growth of population and can be described by the differential equation.

$$\frac{d}{dt}N(t) = aN(t), \text{----------(1)}$$

where N(t) is the population of given species at time t and 'a' is the growth rate.

Solving (1), we get $N(t) = N_0 e^{at}$, where N_0 is the initial population.

Hence any species satisfying the Malthusianlaw grow exponentially with time.

Verhulst Model

A Belgian Mathematician Verhulst showed that the population growth not only depends on the population size but also on how far this size is from its upper limit ie., carrying capacity. He modified Malthu's model to make the population size proportional to both the previous and a new term [a – b N(t)]/a, where a and b are called the vital coefficient of the population. This term reflects how far the population is from its maximum limit. However as the population value grows and gets close to a/b, this new term will become very small and get to zero.

So the modified equation using this new term is

$$\frac{d}{dt}N = aN - bN^2$$

$$\text{i.e,} \frac{dN}{aN - bN^2} = dt$$

$$\text{i.e,} \frac{1}{a}\left(\frac{1}{N} + \frac{b}{a - bN}\right)dN = dt$$

Integrating,

$$\frac{1}{a}[\log N - \log(a - bN)] = t + c \qquad \text{---------- (2)}$$

Using t=0 and N=N_o, we get

$$c = \frac{1}{a}[\log N_0 - \log(a - bN_0)]$$

$$= \frac{1}{a}\log\left[\frac{N_0}{a - bN_0}\right]$$

(2) becomes

$$\frac{1}{a}\log\left[\frac{N}{a - bN}\right] = t + \frac{1}{a}\log\left[\frac{N_0}{a - bN_0}\right]$$

Solving this for N,

$$N = \frac{a/b}{1 + \left[\frac{a/b}{N_0} - 1\right] e^{-at}} \qquad \text{--------(3)}$$

Taking limit as t→∞, we

get $N_{max} = \lim_{t\to\infty} N = \frac{a}{b}$, since $a > o$

Suppose that at time t=1 and t=2, the values of N are N_1 and N_2 respectively, then from (3), we obtain

$$N_1 = \frac{a/b}{1 + \left(\frac{a/b}{N_0} - 1\right) e^{-a}}$$

and $$N_2 = \frac{a/b}{1 + \left(\frac{a/b}{N_0} - 1\right) e^{-2a}}$$

Eliminating b/a from these two equations we get $e^{-a} = \frac{N_0(N_2 - N_1)}{N_2(N_1 - N_2)}$ ---(4)

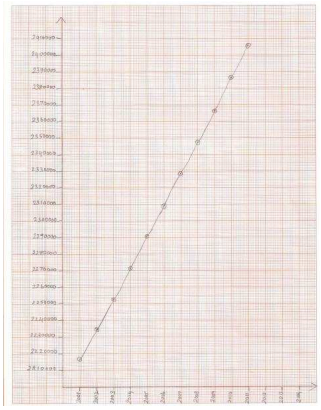
The limiting value of N is given by

$$N_{max} = \lim_{t\to\infty} N = \frac{N_1(N_0N_1 - 2N_0N_2 + N_1N_2)}{N_1^2 - N_0N_2}$$

Result

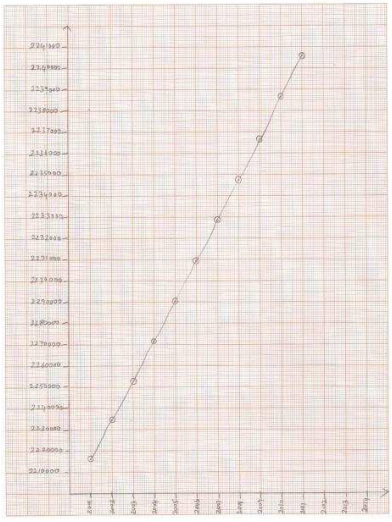
The following table gives the actual and predicted values of population in Thanjavur.

Year	Actual Population	Predicted Population
2001	2216138	2216138
2002	2234420	2234420
2003	2252852	2252852
2004	2271436	2271435
2005	2290174	2290171
2006	2309066	2309060
2007	2328114	2328104
2008	2347319	2347301
2009	2366682	2366661
2010	2386206	2386179
2011	2405890	2405856



Graph of Actual Population values

Graph of Predicted Population values



References

1. Bender. E.A. "An Introduction to Mathematical Modelling", Wiley, New York, 1978.
2. Gause, G.F. "The Struggle for Existence", Williams and Williams Co., Baltimore, 1934.
3. Kapur J.N and Khan Q.J.A. "Some Mathematical models for Population Growth" (Indian J. Pure appl. Math., 10 (3): 277 – 286, March 1979).
4. Thanjavur Child Population 2011 www.municipality.tn.gov.in/thanjvaur.

ANTIOXIDANT ACTIVITY OF LEAVES EXTRACT OF *POLYALTHIALONGIFOLIA*

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ABSTRACT

In vitro antioxidant activity of Polyalthialongifolia and the impact of extraction solvent polarity on the antioxidant potential were investigated in the present study. 100% ethanol, 50% ethanol and water were chosen as extraction solvent due to arithmetic progression of their polarity. Total polyphenol, flavonoid, β-carotene, tannin and vitamin C content of these three extracts were determined while their antioxidant potentials were assayed by total reducing power assay and 2, 2-diphenyl-1-picrylhydrazyl (DPPH)-scavenging activity. 50% ethanol extract of P.longifoliacontained significantly higher amount of polyphenol, flavonoid while moderate amount of carotene and tannin but the lowest amount of vitamin C compared to 100% ethanol and water extract. All the phytochemicals showed solvent polarity specific extraction pattern. Total reducing power and DPPH-radical scavenging activity of 50% ethanol extract also were significantly higher when compared to those of the 100% ethanol and water extracts. Significant variations of antioxidant potentials of P.longifoliadue to differences in the extraction solvent polarity were demonstrated in this study.

Keyword: *Antioxidant, Flavoniod, P.longifolia, DPPH, Polarity Index*

INTRODUCTION:

Oxidative stress occurs when the generation of free radicals or reactive oxygen species (ROS) exceeds the antioxidant capacity of a biological system[1]. Excess free radicals and ROS attack biological molecules such as lipids, proteins and nucleic acids that lead to tissue or cellular injury[2,3]. Oxidative stress has already been implicated in atherosclerosis, cancer, diabetes, arthritis, reperfusion damage and inflammation[4].

Antioxidants are free-radical scavengers that provide protection to living organisms from damage caused by ROS. Although almost all organisms possess antioxidant defense and repair systems but these systems are insufficient to copeover entire damage. So, dietary antioxidant supplementation is a promising mean to strengthen the antioxidant defense and repair systems. However, antioxidants from natural source are of great value as most commonly used synthetic antioxidants (e.g.butyl aldehyde hydroxyanisole, butylaldehyde hydroxytoluene and propylgallate) have health hazardous side effects like liver damage and carcinogenesis [5].

PolyalthialongifoliaBenth.commonly called, Ashoka (Family: Annonaceae) is a tall, evergreen and attractive plant

commonly grown as ornamental avenue tree. The various parts of the plant have been used in traditional system of medicine for the treatment of fever, skin diseases, diabetes, hypertension and helminthiasis. A number of biologically active compounds have been isolated from this plant**.** The plant extract and isolated compounds have been studied for various biological activities such as, antibacterial, antifungal, anti-inflammatory and cytotoxic [6]. Antitumour and antioxidant activity of P. longifoliastem bark ethanol extract has been reported. In vitro cytotoxic potential of P.longifolialeaves on human cancer cell lines has been reported for the first time in 2008[7] and antioxidant activity of ethanolic extract of seeds have been reported recently. However not much work has been reported on seeds and leaves of P.longifolia.We, therefore, investigated in vitro antioxidantactivity of P.longifoliaand the impact of the extraction solvent polarity on antioxidant potential in this present study.

MATERIALS AND METHODS

Collection of Plant Materials andExtraction

P.longifolialeaves were collected from the village side of Mannargudi, identified and authenticated. The collected leaves were washed with sterile water and shade dried and powdered and stored in an air tight container. The fresh leaves with petioles were then air dried in shadow and grinded by mechanical grinder. Fine plant powder was then used for the exhausted extraction by Soxhlet apparatus for four repeated cycle using 100%ethanol, 50% ethanol and water as extraction solvent. During extraction solute-solvent ratiowas 10:1 and extraction temperature was45º±2ºC. The extracts were then filtered, evaporated using oven to a thick residue at 45°Cand stored at 4°C. This crude extract was used forfurther analyses.

Total Polyphenol Content

Total polyphenol content of extracts was determined following using pyrogallol as standard [8]. The concentration oftotal phenol compounds in extracts was determined as pyrogallol equivalents (µg ofPE/mg of extract).

Total Flavonoid Content

Total flavonoid content of extracts was estimated following aluminum chloridecolorimetric assaydescribed by [8]. Quercetin was used as standard. The concentration of total flavonoid in the extract was determined asquercetin equivalents(µg of QE/mg of extract).

β-carotene Content

ß-carotene content of extracts was determined bythe method described by [9] with slight modification.The driedextract of P.longifolia(100 mg) was vigorouslyshaken with 10 ml of acetone - hexane (4:6) for 1min and filtered through filter paper (WhatmanNo. 4). The absorbance of the filtrate wasmeasured at 453, 505, 645 and 663 nmspectrophotometrically. ß-carotene content wascalculated according to the following equations:

ß-carotene (mg/100 ml) = 0.216 ×A663 – 1.22×A645 – 0.304× A505 + 0.452 × A453

The concentration of ß-carotene in the extractswas expressed as µg of ß-carotene /mg of extract.

Total Tannin Content

Total tannin content of extracts was determined by the Folin-Ciocalteu's method using tannic acid as standard[10]. The concentration of total tannin in extracts was expressed as tannic acid equivalents (µg of TE/mg of extract).

Vitamin-C content

Vitamin C content of extracts was estimated bythe method of [11]. Vitamin Cwas used as standard. The vitamin C content ofextract was calculated as ascorbate equivalents(µg of AE/mg of extract).

Total Reducing Potential

The reducing power of extracts was estimated following Oyaizu (1986) using vitamin C asstandard [12]. The reducing power of extract was calculated as ascorbic acid equivalents (µg ofAE/mg of extract).

DPPH (2, 2-diphenyl-1-picrylhydrazyl)Scavenging Activity

DPPH-free radical scavenging activity of extractswas measured following [13].DPPH-free radical scavenging activity was calculated as % of radical inhibition by following equation:

% Radical Inhibition = {(Control OD – Sample OD)/ Control OD)} X 100

DPPH-free radical scavenging activity was calculated and expressed as IC50 that is the concentration of P.longifolia required to scavenge50% of DPPH used.

Statistical Analysis

The results are expressed as mean ± SEM(Standard error of mean). The statistical programsused were StatView® 4.01 (MindVisionSoftware, Abacus Concepts, Inc., Berkeley, CA,USA) and GRAPHPAD PRISM® (version 4.00;GraphPad Software Inc., San Diego, CA, USA). Intergroup variation was analyzed by one way ANOVA followed by Tukey's least square differences test for post hoc comparisons. A levelof $P<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Antioxidant activity of a plant extract is ac omplex attribute of its phyto constituents. In the present study we have estimated total polyphenol,total flavonoid, ß-carotene, tannin and vitamin Ccontent in three different extracts namely 100%ethanol extract, 50% ethanol extract and waterextract ofP.longifolia. The results of thephytoconstituents content of these three extractshave been summarized in Table 1.Polyphenols are available plant secondarymetabolites and a critical index for determining the antioxidant capacity[14]. The antioxidantactivity of polyphenols are mainly due to theirredox properties, which allow them to act asreducing agents, hydrogen donors, singlet oxygenquenchers and metal chelators. Themechanisms of action of flavonoids are exertedthrough scavenging or chelating process.Vitamin C directly interacts with a broadspectrum of ROS and terminates chain reaction initiated by these free radicals through electrontransfer while involved in the regeneration ofvitamin E. ß-carotene is an excellent scavengerof singlet oxygen's.

In the present investigation, total reducing potential assay and the DPPH scavenging activity were performed to evaluate in vitro antioxidant potential of three different extracts of P.longifolia including 100% ethanol extract, 50% ethanol extract and water extract. Total reducing power of50% ethanol extract of P.longifolia(63.4±1.7 µgof AE/ml) was significantly higher than total reducing power of 100% of ethanol extract of P.longifolia(40.4±0.7 µg of AE/ml) and water extract of P.longifolia(56.3±0.6 µg of AE/ml) (Table 2).

DPPH is a relatively stable nitrogen centered free radical that easily accepts an electron or hydrogen when reacts with suitable reducing agents a sresults of which the electrons become paired off and the solution losses color

depending on the number of electrons taken up[15]. In case ofDPPH-scavenging activity, IC50 values of 100%ethanol extract of P.longifolia, 50% ethanol extract of P.longifolia and water extract of P.longifolia were 35.6±1.3 µg/ml , 7.1±1.5 µg/ml and10.3±1.2 µg/ml respectively. IC50 values of 50%ethanol extract of P.longifolia and water extract of P.longifolia were nearly similar and not significantly (P>0.05) different. But, IC50 value of 50% ethanol extract of P.longifolia was significantly higher than that of 100% ethanol extract and water extract (Table 2).reflected by reducing potential and DPPH scavenging activity of corresponding extract[16].We therefore, speculated that observed totalreducing power and DPPH scavenging activity of the different extracts may be the contribution of one or more antioxidant phyto constituents. We chose 100% ethanol, 50% ethanol and wateras extraction solvent in the present study. The polarity index value for 100% ethanol, 50%ethanol and water are 5.2, 7.1 and 9,respectively. We took the arithmetic progression pattern (9-7.1=1.9; 7.1-5.2=1.9) of polarity as advantage to select the solvent of interest. Maximum extraction of bothpolyphenols and flavonoids occurs within a selective polarity range. Any deviation from thatrange either to higher polarity or to lower polarity decreases the extraction yields. The extraction yield for tannin was observed to decrease up to a steady state with the increase of polarity. ß carotene showed a gradual decrease in extraction yield with the increase of polarity. Interestingly maximum extraction of vitamin C was found inboth higher and lower solvent polarity.

During extraction, organic solvents diffuse into the solid material and solubilize the compound with similar polarity. The nature of the solvent used will determine the type of chemicals likely extracted from plant materials. Polarity is the relative ability of a molecule to engage in strong interactions with other polar molecules[17].Polarity therefore represents the ability of a molecule to enter into interactions of all kinds.

Polar solvents have property of dipole interaction forces, particularly hydrogen-bond formation for which solvating a molecule become soluble and leads to the solubility of the compound. Most of the bioactive components of plant matrices are medium-sized molecules. Due to the presence of aromatic delocalized µ-electrons, the molecules are highly polarizable[18]. Therefore, difference in the polarizability makes the phytochemicalsliable to a variety of specific interactions withpolar solvents that lead to polarity dependent extraction yield variation. This can explain the present observation though further studies are essential to explain the phenomenon minutely.

CONCLUSION

Besides the food value P.longifoliais used in a wide range of pharmacological activity within theeth nobotanic frame worldwide. Emphasis should be paid to the extraction solvent property as variation of pharmacological activity might beattributed through extraction solvent differences. Thus, significant variation of antioxidantpotential of P.longifoliadue to extraction solvent polarity difference was demonstrated in this study.

Table 1. Antioxidant phytoconstituents of 100% ethanol extract of P.longifolia(100% E Ex), 50% ethanol extract of P.longifolia (50% E Ex) and water extract of P.longifolia(H2O Ex).

Antioxidant Phytoconstituents	Content (µg/mg of extract		
	100% E Ex	50% E Ex	H2O Ex
Polyphenols (PE)	21.1±0.1a	45.2±0.3b	35.6±0.5c
Flavonoids (QE)	9.3±0.3a	14.6±0.2b	11.7±0.2c
ß-Carotene	1.1±0.4a	0.7±0.1a	0.2±0.1a
Tannin (TE)	85.7±3.3a	59.7±0.9	60.7±1.8b
Vitamin C (AE)	12.5±0.7a	9.5±0.2b	13.3±0.4a

Results are mean±SEM (n=3). PE, Pyrogallol Equivalent; QE, Quercetin Equivalent; TE, Tannic acid Equivalent; AE,Ascorbic acid Equivalent. Intergroup variation was analyzed by one-way ANOVA followed by Tukey'sleast squaredifferences test for post hoc comparisons. Values in the same row with different subscription are significantly different at P< 0.05.

Table 2. Comparative in vitro antioxidant activity of 100% ethanol extract of P.longifolia(100% E Ex), 50% ethanol extract of P.longifolia(50% E Ex) and water extract of P.longifolia(H2O Ex).

Extracts	100% E Ex	50% E Ex	H2O Ex
Reducing power (AE)	40.37±0.73	63.4±1.72	56.3±0.57
DPPH scavenging Activity (IC50)	35.56±1.24	7.08±1.54	10.23±1.20

Results are mean ± SEM, n= 3. AE, Ascorbic acid Equivalent; IC50 =Concentration required to inhibit 50% of DPPHradical. Intergroup variation was analyzed by one way ANOVA followed by Tukey's least square differences test for posthoc comparisons. Values in the same row with different subscription are significantly (P<0.05) different.

REFERENCES

1. Zima TS, Fialova L, Mestek O, Janebova M, Crkovska J, Malbohan I. Oxidative stress, metabolism of ethanol and alcohol-related diseases. Journal of Biomedical Science.2001; 8:59-70.
2. Halliwell B, Gutteridge JMC. Free radicals in biology and medicine. Ed 3, Oxford UniversityPress, Oxford, 1999; 415-421.
3. Stadtman ER. Role of oxidant species in aging. Current Medicinal Chemistry.2004; 11: 1105–1112.
4. Kolar P, Shen JW, Tsuboi A, Ishikawa T. Antioxidants and the degenerative diseases of aging. Proceedings of the National Academy ofSciences of the United States of America.1993;90(17): 7915–7922.
5. Buxiang S. Fukuhara M. Effects of coadministration of butylated hydroxytoluene,butylatedhydroxyanisole and flavonoide on the activation of mutagens and drug-metabolizingenzymes in mice. Toxicolology.1997; 122:61–72.
6. Varrier PS. Indian Medicinal plant. Vol. 11,OrientLingman Limited, Madras, 1997;51- 52.
7. Ghosh, M.K. Durga, B.S. Bharata, and K.M. Sagar. Anti-hyperglycemic and antioxidant activity of stem bark of Polyalthialongifoliavar. angustifolia. Der Pharmacia Let. 2010;2(2): 206-216.
8. Rao, and F. Rehman. Use of polyalthialongifolia seeds (seeds of indian mast tree) as adsorbent for the removal of cd(II) from aqueous solution. J. Disper. Sci. Technol. 2012, 33(4): 472-481.
9. Sasidharan, I Darah, and M.K. Mohd Jain Noordin. Free radical Scavenging Activity and Total Phenolic Compounds of

Gracilariachangii. Int. J. Nat. Eng. Sci. 2007, 1(3): 115-117.
10. Yen, and H.Y. Chen. Antioxidant activity of various tea extracts in relation to their antimutagenicity. J. Agri. Food Chem. 1995, 43(1): 27-32.
11. S.M. Klein, G. Cohen, A.I. Cederbaum. Production of formaldehyde during metabolism of dimethylsulphoxide by hydroxyl radical generating system. Biochem.,1991;20: 6006-6012.
12. Brand-Williams, M. Cuvelier, and C. Berset. Use of a free radical method to evaluate antioxidant activity. Lebensmittel-Wissenschaft und –Technologie. 1995;Vol 28, pp. 25–30.
13. Duh.P.D. Antioxidant activity of Burdock (Arctiumlappa Linne): its scavenging effect on free-radical and activeoxygen. J. Am. Oil Chem. Soc., 1998;75: 455–461.
14. K. Shimada, K. Fujikawa, K. Yahara, T. Nakamura. Anti-oxidative properties of xanthan on the autoxidation ofsoybean oil in cyclodextrin emulsion. J. Agr. Food Chem. 1992, 40: 945–948.
15. Xing, S. Liu, Z. Guo, H. Yu, P. Wang, C. Li, Z. Li, and P. Li. Relevance of molecular weight of chitosan and its derivatives and their antioxidant activities in vitro. Bioorg. Med. Chem. 2005, 13: 1573–1577
15. Hamid AA, Shah ZM, Muse R, Mohamed S.Characterization of anti oxidative activities of various extracts of Centellaasiatica(L) Urban.Food Chemistry. 2002; (4): 465–469.
16. Zainol MK, Abd-Hamid A, Yusof S, Muse R.Antioxidative activity and total phenolic compounds of leaf, root and petiole of fouraccessions of Centellaasiatica(L.) Urban. Food Chemistry. 2003; 81(4): 575–581.
17. Pittella F, Dutra RC, Junior DD, Lopes MTP,Barbosa NR. Antioxidant and Cytotoxic Activities of Centellaasiatica(L) Urb. International Journal of Molecular Science..2009; 10(9): 3713-3721.
18. Amin I, Norazaidah Y, Hainida KIE. Antioxidantactivity and phenolic content of raw and blanched Amaranthus species. Food Chemistry.2006; 94: 47-52.

சோழர்களின் கடற்பயணமும் வாணிபமும்

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முன்னுரை:

பண்டைக் காலத்தில் நாடோடியாகத் திரிந்த மனிதன் ஆற்றின் கரையோரங்களில் தான் முதன் முதலாக நிலையானதொரு வாழ்க்கையை வாழ ஆரம்பித்தான். நாகரீகமும் ஆற்றுப் பள்ளத்தாக்குகளில் தங்குவதனால் மனிதனுக்கு போக்குவரத்தும் மீன்பிடித்தலும் எளிதாக அமைந்தன. இந்நிலையில் கடலில் கலம் செலுத்தி உலகம் முழுவதும் உலவி வாழ்ந்தவர்கள் இந்தியர்களாகத் தான் இருக்க வேண்டும் என்று வரலாற்றாசிரியர்கள் கருதுகின்றனர். குறிப்பாகத் தென்னக மக்கள் என்றும், அதிலும் சிறப்பாகத் தமிழ் மக்கள் என்றும், வரலாற்றுக் காலத்திற்கு முன்பே மேல்திசை நாடுகளுடனும், கீழ்த்திசை நாடுகளுடனும் கடல்வழி வாணிகத் தொடர்பு கொண்டிருந்தார்கள் என்பதைப் பழந்தமிழ் நூல்களின் வாயிலாக அறியமுடிகிறது. தமிழர்களின் காலம் பொற்காலம் என்று அழைக்கப்பட்ட சோழர் ஆட்சியில் கடற்பயணமும், வாணிபமும் எவ்வாறு அமைந்திருந்தது என்பதை இக்கட்டுரையில் காண்போம்.

தமிழர்கள் அறிமுகம் செய்த கப்பல்கள்:

கடல் கடந்து வாணிபம் செய்வதற்கு ஏற்ற கப்பல்களையும் தமிழக மக்கள் அக்காலத்தே கட்டத் தெரிந்திருந்தார்கள். கலஞ்செய் கம்மியர் அக்காலத்தில் மிகுதியாக இருந்தனர். கட்டுமரம், ஓடம், புணை, படகு, பரிசல், தோணி, திமில், அம்பி, வங்கம், நாவாய், கப்பல் முதலியவற்றை நீர்ப்பரப்பில் பயணத்திற்கென்று உருவாக்கினர்.

'பரிமுக அம்பியும், கரிமுக அம்பியும்
அரிமுக அம்பியும் அருந்துறை இயக்கும்'(சிலம்பு.புறஞ்சேரி:176-177)

"வங்கம் ஏறினன் மணிபல்லவத்திடை"
(மணி.25:126)

மன்னனுடைய கோட்டை, கப்பல் போன்று காட்சி அளித்தது என்று புறநானூற்றுக் குறிப்பு பகர்கிறது.

"பிணங்கு கதிர்க் கழனி நாப்பண் ஏமுற்
றுணங்கு கலன் ஆழியிற் றோன்றும்
ஓரெயின் மன்னன்" (புறம்-338:10-12)

"உலகுகிளர்ந் தன்ன உருகெழு வங்கம்
புலவுத் திரைப் பெருங்கடல் நீர்இடைப் போழ"
(அகம்-255:1-2)

என்று அகநானூறு பகர்கிறது.

"அருங் கலம் தரீஇயர், நீர்மிசை நிவக்கும்
பெருங்கலி வங்கம் திசை திரிந்தாங்கு"(பதிற்று-52:3-4)

சங்க காலத்தில் பெரிய அளவில் கப்பல்கள் இருந்தன என்பதையும், எல்லா வசதிகளுடன் நிறை மக்கள் பயணம் செய்வதற்கு ஏற்ற அளவில் கப்பல்கள் இருந்தன என்பதையும் இச்சான்றுகளால் அறிந்து கொள்ள முடிகிறது.

சோழர்கள் கண்ட கப்பல்கள்:

கடல் வாணிகம் முற்காலச் சோழர்கள் காலத்தில் சிறந்து விளங்கியது. இங்கிலாந்து கடல் அரசியாகத் திகழ்ந்தது போல, சோழர்கள் காலத்தில் தமிழகம் கடல் அரசியாகத் திகழ்ந்தது.

"நளியிரு முந்நீர் நாவாய் ஓட்டி
வளி தொழில் ஆண்ட உரவோன் மருக"
(புறம்.66:2)

என்ற பாடலில் சோழமன்னன் ஒருவன் பருவக் காற்றைப் பயன்படுத்திக் கப்பலோட்டியமையாலே காற்றை ஏவல் கொண்டவனாகச் சிறப்பிக்கப்பட்டு இருக்கிறான். இலங்கைப் பழங்கதை கொண்டு, சோழன் திருமாவளவன் கடல் கடந்து சென்று இலங்கை மன்னனை வென்று பன்னீராயிரம் சிங்களவர்களைச் சிறைபிடித்து நாடு திரும்பினான் என்பதை அறிய முடிகிறது. அச்சிறைக் கைதிகளைக் கொண்டு, காவிரிக்குக் கடலிலிருந்து கல்லணை வரை கப்பல் போகும் அளவிற்குக் கரை எடுத்து வணிகத்தையும், உழவுத் தொழிலையும் வளர்த்தான் என்று வரலாறு உரைக்கிறது.

கி.பி.இரண்டாம் நூற்றாண்டில் ஆட்சி புரிந்த சோழர்களில் தலைசிறந்த மன்னனான கரிகால் சோழன், தரைவழி நடைபெற்ற வாணிகத்தில் ஈடுபட்டுப் பெரும்பொருள் ஈட்டிய வணிகருக்கு 'மாசாத்துவான்' என்ற பட்டமும், கடல்வழி சென்று வாணிகத்தில் ஈடுபட்டுப் பெரும்பொருள் ஈட்டிய வணிகருக்கு 'மாநாயக்கர்' என்ற பட்டமும் தந்து வணிகர்களை ஊக்குவித்தான்.

சோழ மன்னர்களுக்குத் 'திரையர்கள்' என்ற பெயர் இருந்தது. திரை என்றால் அலை என்று பொருள். அதாவது

கடலை ஆளுகின்ற தலைவர்களாகச் சோழர்கள் விளங்கினார்கள் என்பதை உணரமுடிகிறது.

துறைமுகத்தின் பங்கு:

கப்பல்கள் துறைமுகத்திற்கு வந்து சேரும் போதும்,அதை விட்டுப் புறப்படும் போதும் முரசங்கள் முழங்கப்பட்டன.

"இன்னிசை முரச முழங்கப்
பொன்மலிந்த விழுப்பண்டம்
நாடார நன்கிழிதரும்
ஆடியற் பெருநாவாய்" (மதுரை:80-84)

துறைமுகத்திற்கு வந்து சேரும் கப்பல்களிலிருந்து பொருள்கள் கழிகளில் இயங்கும் தோணிகளாற் கரைசேர்க்கப் பட்டன. அக்காலத்தில் காவிரியாறு அகன்றும், ஆழ்ந்தும் இருந்ததால் பெருங்கப்பல்களும் கடலில் நிற்காது நேரே ஆற்று முகத்திற் புகுந்தன.

"..... ..... கூம்பொடு
மீப்பாய் களையா மிசைப்பரந்ததோடாது
புகாஅர்ப் புகுந்தபெருங்கலம் தகாஅர்"
(புறம்.30:11-13)

பாய் களையாது, பரந்தோடா தென்பதனால் துறை நன்மை கூறியதாம் என்று பழைய உரை கூறுகிறது. இங்ஙனம் கரிகால் வளவன் காவிரிக்குக் கரை கட்டியது நோக்கத்தக்கதாகும்.

கப்பல்கள் நிறைந்திருந்தன.

"வெளில்இளக்கும் களிறுபோலத் தீம்புகார்த்
திரைமுன்றுறைத்தூங்கு நாவாய் துவன்றிருக்கை"
(பட்டினப்.172-174)

என்னும் அடிகள் வழி இதனை அறியலாம்.

இறக்குமதிப் பொருள்கள்:

பூம்புகார்த் துறையில் இரவிலும், பகலிலும் மரக்கலங்கள் வந்து போய்க் கொண்டிருந்தன. இங்குப் பொன்னும், மணியும், சந்தனமும், அகிலும், முத்தும், பவளமும், மாணிக்கமம், யானையும், சீனத்துக் கற்பூரமும், பன்னீரும் வந்து குவிந்தன என்று பட்டினப்பாலை பகர்கிறது.

"நீரின் வந்த நிமிர் பரிப்புரவியும்
காலின் வந்த கருங்கறி முடையும்
வடமலைப் பிறந்த மணியும் பொன்னும்
குடமலைப் பிறந்த ஆரமும் அகிலும்"
(பட்டினப்.185-188)

கடல் வழியாகவும், தரை வழியாகவும் பல நாட்டுப் பொருள்கள் காவிரிப்பூம்பட்டினத்தில் வந்து குவிந்தன.அதனால் வாணிகம் வளர்ந்தது, செல்வம் பெருகியது. கரிகால் சோழன் என்று குறிக்கப்பட்ட திருமாவளவனின் தலைநகரமாகிய இந்நகர் "குணகடலின் கோமகள்" என்று அயல் நாட்டினரும் புகழத்தக்க விதத்தில் விளங்கியது.

ஏற்றுமதியும், இறக்குமதியும் ஏராளமாயிருந்ததால் நாள்தோறும் ஆயத்துறைக் கணக்கர் மூடைகளை நிறுத்து உல்கு (சுங்கம்) வாங்கி வேந்தன் முத்திரையைப் பொறித்துக் குன்று போற் குவித்து வைத்திருந்தனர்.அவற்றிற்குக் கடுமையான காவலிருந்தது.**"வைகல்தொறும் அசைவின்றி**
உல்கு செயக் குறைபடாது
....
நீரின்று நிலத்தேற்றவும்
நிலத்தினின்று நீர்ப்பரப்பவும்
அளந்தறியாப் பலபண்டம்
வரம்பறியாமை வந்தீண்டி
அருங்கடிப் பெருங்காப்பின்
வலியுடை வல்லணங்கினோன்
புலி பொறித்துப் புறம்போக்கி
முதி நிறைந்த மலிபண்டம்
பொதிமூடைப் போரேறி
(பட்டினப்.124-134)

என்னும் பாடல்வழி இது தெரிய வருகிறது.

கலங்கரை விளக்கம் :

கடலில் செல்லும் பரதவர் இரவில் மீள, கரை ஓரங்களிலுள்ள வீடுகளில் தெரியும் விளக்குகளை அடையாளமாகக் கொண்டு வருவர். வீட்டு விளக்கேயன்றிக் கலங்கரை விளக்கமும் இருந்தது என்று இளங்கோவடிகள் கூறியுள்ளார்.

"இலங்குநீர் வரைப்பின் கலங்கரை
விளக்கமும்" (சிலம்பு.6:141)

மேலும்,

"ஓடுங்கலம் கரையும் துறை"
(பெரும்பாண்.350-51)

என்ற வரிகளால் இரண்டாயிரம் ஆண்டுகளுக்கு முன்பே பூம்புகார் நகரில் இக்காலத் துறைமுகப் பட்டினங்களில் காணப்படும், கப்பலுக்குத் துறைகாட்டும் ஒளிவிளக்கு (கலங்கரை விளக்கம்) இருந்தது என்பது புலனாகிறது.

முடிவுரை:

சங்க இலக்கியங்கள் வழி சோழர்களின் கடற்பயணமும், கப்பல்களை பயன்படுத்திய முறையும் அறிய முடிகிறது. துறைமுகங்கள் அமைத்து வாணிபத்தை பெருக்கியமையும், பல்வேறு நாடுகளுடனான தொடர்புகளை மேம்படுத்தி நாட்டினை வளப்படுத்தியமையும் இக்கட்டுரை வழி அறிய முடிகிறது. சோழர்களின் காலம் பொற்காலம் என்பதற்கு இது ஒரு நல்ல சான்றாகவும் அமைகிறது.

BOSE CONSTRUCTION IN STEINER TRIPLE SYSTEM

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ABSTRACT

This paper presents a description of Steiner triple in Graph Theory. In this dissertation, Bose Construction is explained. This dissertation does not go into the details of Steiner triple system yet at this juncture the important details, like theorems & Problems has enough well develop in graph based on that .It can develop a reasonably accurate graph theory concept.

Introduction

Steiner triple systems were defined for the first time by W.S.B. Woolhouse in 1844 in the Prize question #1733 of Lady's and Gentlemen's Diary. [8] The posed problem was solved by Thomas Kirkman (1847). In 1850 Kirkman posed a variation of the problem known as Kirkman's schoolgirl problem, which asks for triple systems having an additional property (resolvability). Unaware of Kirkman's work, Jakob Steiner (1853) reintroduced triple systems, and as this work was more widely known, the systems were named in his honor.

STEINER TRIPLE SYSTEMS

Definition:

A Steiner triple system is an ordered pair $\{S,T\}$, where S is a finite set of Points or symbols, is a set of 3-element subsets of S called triples. Such that each pair of distinct elements of S occurs together in exactly one triple of T. The order of a steiner triple system $\{S,T\}$ is the size of the set, denoted by $|S|$.

Example:

(a) $S = \{1,2,3\}$, $T = \{1,2,3\}$

(b) $S = \{1,2,3,4,5,6,7\}$

$T = \{\{1,2,4\}, \{2,3,5\}, \{3,4,6\}, \{4,5,7\}, \{6,7,2\}, \{7,1,3\}\}$

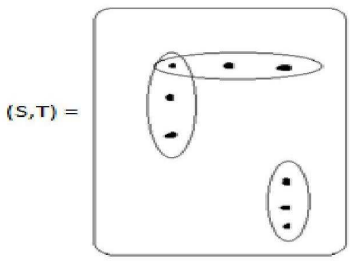
(c) $S = \{1,2,3,4,5,6,7,8,9\}$ &

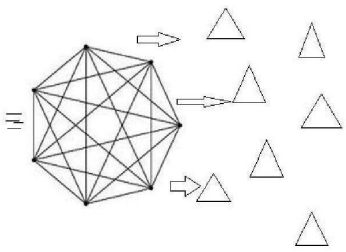
T contains the following triples.

{1,2,3} {1,4,7} {1,5,9} {1,6,8} {4,5,6} {2,5,8} {2,6,7} {2,4,9} {7,8,9} {3,6,9} {3,4,8} {3,5,7}

A Steiner triple system (S,T) can be represented graphically as follows each symbol in s is represented by a triangle joining g the vertices a, b, c. Since each pair of symbols occur in exactly one triple of in T. each edge belongs to exactly one triangle.

Therefore a Steiner triple system (S, T) is equivalent to a complete graph k_s in which the edges have been portioned into triangles (corresponding to the triples in |T|).





Theorem:

A Steiner triple system of order v exists if and only if $v \equiv 1$ or 3 (mod6).

Proof

If (S, T) is a triple system of order ϑ, any triple {a, b, c} contain the three 2-element subsets {a, b}, {b, c} and {a, c} and S contains a total of $\binom{v}{2} = \frac{v(v-1)}{2}$ 2-elements subsets. Since every pair of distinct elements of S occurs together in exactly one triple of T,

$$3|T| = \binom{v}{2} \text{ and so } |T| = \frac{\binom{v}{2}}{3}$$

giving $|T| = \frac{v(v-1)}{6}$

For any x ∈ S, set T(x) = {t/{x} / x ∈ t ∈ T}. Then T(x) partitions S/{X} into 2-element subsets, and so v – 1 even.

Since v – 1 even, v must be odd. A fancy way of saying this is v ≡ 1, 3 or 5 (mod6). However, the number of triples $|T| = \frac{v(v-1)}{6}$ is never an integer when v ≡ 5 (mod6), and so we can rule out v ≡ 5 (mod6) as a possible order of a Steiner triple system.

Hence v ≡ 1 or 3 (mod6) is a necessary condition for the existence of a Steiner triple system of order v.

THE BOSE CONSTRUCTIONS:

Need Some building blocks before presenting the Bose construction.

A latin square of order n is an $n \times n$ array, each cell of which contains exactly one of the symbols in {1, 2, ..., n}, such that each roe and each column of the array contain each of the symbols in {1, 2, ..., n} exactly once.

A quasi group of order n is a pair (Q, •), where Q is a set of size n and operation on Q such that for every pair of elements $a, b \in Q$, the equations is binary have unique solutions. As far as we are concerned a quasi group is just a latin square square with and a sideline.

$$a \bullet \times = b \ \& \ y \bullet a = b$$

The Bose Construction (for Steiner triple system of order $v \equiv 3$ (mod6))

Let $v = 6n + 3$ and let be an idempotent commutative quasi group of order (Q, •)

2n+1, where $Q \times \{1, 2, ..., 2n+1\}$.

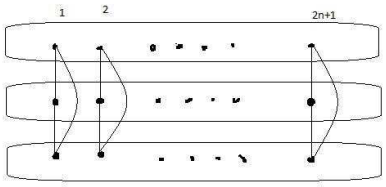
Let $S = Q \times \{1,2,3\}$ and define T to contain the following two types of triples.

Type 1: For $1 \le i \le 2n+1$, $\{(i,1), (i,2), (i,3)\} \in T$

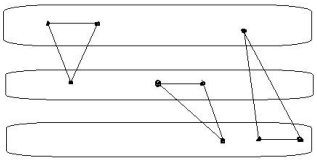
Type 2: For $1 \le i < j \le 2n+1$, $\{(i,1), (j,2), (i \bullet j,1)\}$, $\{(i,2), (j,2), (i \bullet j,3)\}$, $\{(i,3), (j,3), (i \bullet j,1)\} \in T$

Then (S,T) is a Steiner triple system of order $6n+3$.

Type 1 Triples:



Type 2 Triples:



Since $S = \{1,2,...,2n+1\} \times \{1,2,3\}$ it makes sense to reflect this structure of S in the graph by drawing" levels with the 2n+1 vertices 6n+3(i, j vertices) on level j, o for $1 \le i \le 2n+1$ & $1 \le j \le 3$.

Proof

To prove that (S,T) is a Steiner triple system by using: let S be a set of size and let T be a set of 3-element subsets of S. Furthermore, suppose that

(a) Each pair of distinct element of S belongs to at least one triple in T, and

(b) $|T| \leq \frac{v(v-1)}{6}$.

Then (S,T) is a Steiner triple system.

Now begin by counting the number of triples in T. The number of type 1 triples is clearly $2n+1$, and in definition the Type 2 triples, there are $(2n+1) = (2n+1)\ (2n)/2$ choices for i & j, each choice giving rise to 3 triples of Type 2.

Therefore $|T| = (2n+1) + 3(2n+1)\ (2n)/2$
$= (2n+1)\ (3n+1)$
$= \vartheta(\vartheta+1)/6$

Therefore T contains the right number of triples.

Next to show that each pair of distinct symbols in S occurs together in atleast one triple of T. Let (a,b) & (c,d) be such of symbols. Consider three cases.

Case (i): Suppose that $a = c$, then $\{(a,1), (a,2), (a,3)\}$ is a Type I triple in T & contain (a,b) & (c,d).

Case (ii): Suppose that $b = d$, then $a \neq c$ & $\{(a,b), (c,b), (a \bullet c, b+1)\} \in T$ & contains (a,b) & (c,d) [of course, the addition in the second coordinates is done modulo 3]

Case (iii): Finally suppose that $a \neq c$ & $b \neq d$ follow similarly. Since $(Q,\bullet)$ is a quasigroup, idempotent. Assume that $b = 1$ & $d = 2$, as the other cases $a \bullet i = c$ for some $i \in Q$. Since $(S, \bullet)$

And $a \neq c$, it must be that $i \neq a$. Therefore $\{(a,1), (i,1), (a \bullet c, 21)\}$ is a Type 2 in T & contain (a,b) & (c,d).

By "let S be ϑ & let a T be set a of 3 of –element size subset of S. Futher more suppose that

(a) Each pair of distinct elements of S belongs to atleast one triple in T, &

(b) $|T| = \frac{v(v-1)}{6}$

Then (S,T) is a Steiner triple system "it now that (S,T) is a Steiner triple system.

Example:

Construct a STS (9) using the Bose Construction.

Solution:

The idempotent commutative quasigroup of order $v/3 = 3$, so is

•	1	2	3
1	1	3	2
2	3	2	1
3	2	1	3

Let $S = \{1,2,3\} \times \{1,2,3\}$. Then T contain S the following twelve triples:

Type 1:
$\{(1,1), (1,2), (1,3)\}$, $\{(2,1), (2,2), (2,3)\}$, $\{(3,1), (3,2), (3,3)\}$ &

Type 2: $i = 1, j = 2$
$\{(1,1), (2,1), (1 \bullet 2 = 3,2)\}$ $\{(1,2), (2,2), (1 \bullet 2 = 3,3)\}$ $\{(1,3), (2,3), (1 \bullet 2 = 3,1)\}$

$i = 1, j = 3$
$\{(1,1), (3,1), (1 \bullet 3 = 2,2)\}$ $\{(1,2), (3,2), (1 \bullet 3 = 2,3)\}$ $\{(1,3), (3,3), (1 \bullet 2 = 2,1)\}$

$i = 1, j = 2$
$\{(2,1), (3,1), (2 \bullet 3 = 1,2)\}$ $\{(2,2), (3,2), (2 \bullet 23 = 1,2)\}$ $\{(2,3), (3,3), (2 \bullet 3 = 1,2)\}$

Conclusion

Using the Bose construction in orthogonal Latin square and also Steiner triple system with give subspace in the research field and also we will find out to the solve on a problem in combinations, using the above construction in graph theory, it is given by T.P. Kirman. Cambridge and Dublin Math. Journal, 2(1847), 191-204. Also we can apply this concept in the area of computer networking.

REFERENCES:

- Colbourn, C. J. and Dinitz, J. H. (Eds.). "Steiner Triple Systems." §4.5 in *CRC Handbook of Combinatorial Designs*. Boca Raton, FL: CRC Press, pp. 14-15 and 70, 1996.
- Kaski, P. and Östergård, P. R. J. "The Steiner Triple Systems of Order 19." *Math. Comput.* **73**, 2075-2092, 2004.
- Kaski, P.; Östergård, P. R. J.; Topalova, S.; and Zlatarski, R. "Steiner Triple Systems of Order 19 and 21 with Subsystems of Order 7." http://www.tcs.hut.fi/~pkaski/19and21.ps.
- Kirkman, T. P. "On a Problem in Combinatorics." *Cambridge Dublin Math. J.* **2**, 191-204, 1847.
- Lindner, C. C. and Rodger, C. A. *Design Theory*. Boca Raton, FL: CRC Press, 1997.
- Ryser, H. J. *Combinatorial Mathematics*. Buffalo, NY: Math. Assoc. Amer., pp. 99-102, 1963.
- Sloane, N. J. A. Sequence A030129 in "The On-Line Encyclopedia of Integer Sequences."
- Stinson, D. R. and Ferch, H. "2000000 Steiner Triple Systems of Order 19." *Math. Comput.* **44**, 533-535, 1985.