MEMORANDUM OF UNDERSTANDING BETWEEN
R. C. PATEL ARTS, COMMERCE AND SCIENCE COLLEGE, SHIRPUR
AND
DEPT OF PHARMACOLOGY SPTM, SVKM's NMIMS MUKESH PATEL TECHNOLOGY PARK, SHIRPUR

FOR THE DEVELOPMENT OF ACADEMIC AND RESEARCH COOPERATION

The present MoU is signed on July 15, 2020 between R. C. Patel Arts, Commerce and Science College, Shirpur AND Department of Pharmacology, School of Pharmacy & Technology Management, SVKM's NMIMS, Mukesh Patel Technology Park, Shirpur

The MoU has following objectives:

1. To share the research and laboratory facilities of the Department of Pharmacology, School of Pharmacy & Technology Management, SVKMs NMIMS, MPTP, Shirpur and the Department of Microbiology, R. C. Patel ASC College, Shirpur.
2. To facilitate training for the PG students and the faculty
3. To undertake interdisciplinary research projects for the PG students of both the institute.
4. To explore the opportunities of joint supervision of industrial projects with the Department

Duration of the MoU:
The duration of the MoU will be for FIVE years and upon review it can be further extended for TWO years.

Coordinators:
Both the institute will appoint a person in charge for the MoU who will take the responsibility of the agreement.

IPR benefits:
IPR benefits of the joint research work will be shared by both the institutes.

Signatures

On behalf of

R. C. Patel Arts, Commerce and Science College, Shirpur

On behalf of

Dr SATEESH BELEMKAR

Department of Pharmacology SPTM, SVKMs NMIMS
Mukesh Patel Technology Park, Shirpur

R. C. Patel Educational Trust's
R. C. Patel Arts, Commerce and Science College
Karvand Naka, Shirpur 425405, Dist - Dhule, Maharashtra
☎: (02563) 299328
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President
Hon. Bhupeshbhai Patel

Principal
Dr. D. R. Patil

Name of Institute/Industry :- SVKM's NMIMS, Shirpur Campus, Shirpur

Year of Signing Linkage/ MoU :- 2020

Duration of Linkage/MoU :- 05 Years

List of Activities carried out under MoU with SVKM's NMIMS, Shirpur Campus, Shirpur

Authorized signatures:

PRINCIPAL
R. C. Patel Educational Trust's
R. C. Patel Arts, Commerce and Science College
Shirpur, Dist.-Dhule (M.S.) 425405

NAAC Re-Accredited
(3rd Cycle)

Rajiv Gandhi Science and Technology Commission, KBCNMU Centre

Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon
P.O. Box # 80, Umavinagar, Jalgaon – 425001 (M.S.), India

Assistance for S &IT Applications through University System

Ref.: KBCNMU/RGSTC/Sanction Order/ 80 **Date: 24/02/2022**

To,
The Principal
R. C. Patel ASC College, Shirpur

Subject: Financial assistance for a research project under the Scheme "Rajiv Gandhi Science & Technology Commission (RGS&TC), Government of Maharashtra" through 'Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon'

Ref.: KBCNMU/RGSTC/Proposal/by hand/40 dated 16/12/2020

A project entitled: "Development of microbial consortium for the degradation of harmful dyes in effluents of textile industries in North Maharashtra region"

Project code No.: 20-LSR

Sir/Madam,

With reference to the above subject and letter under reference, I am to refer to your letter forwarding the research proposal of **Dr. Sandip P. Patil (PI),** Assistant Professor with **Mr. T. A. Shinde (Co-PI),** Assistant Professor, SVKM's NMIMS University, Shirpur of your College for getting financial assistance under the above scheme and convey the approval & sanction the grant of **Rs. 2,50,000/-** (Rupees Two lakhs fifty thousand only) and release the amount of **Rs. 85,000/-** (Rupees Eighty five thousand only) as a 1st installment to The Principal, R. C. Patel ASC College, Shirpur in respect of research project **Dr. Sandip P. Patil (PI),** and **Mr. T. A. Shinde (Co-PI)** for the period of 23 Months as detailed below:

Sr. No.	Item	Amount Approved (Rs.)	Grant Released as Ist Installment (Rs.)
A.	**Non-Recurring**	Nil	Nil
B.	**Recurring**		
	Contingency	70,000	10,000
	Consumables	1,50,000	70,000
	Travel/ Field work	Nil	Nil
	Other	30,000	5,000
	Total (A+B)	**2,50,000**	**85,000**

1. The sanctioned amount is debited from the RGST&TC grants 2021-2022 under Rajiv Gandhi Science & Technology Commission (RGS&TC) Project head.
2. The date of initiation of the project will be **10-03-2022.**
3. The Principal Investigator must send the acceptance certificate in prescribed format to the undersigned within 10 days from the issue of the award letter failing, it will be presumed that the Principal Investigator is not willing to implement the project and approval will be withdrawn.

Contact:
Prof. D. S. Patil (Member Secretary) – 09423515937 (O) – 0257 2257475 e-mail: rgstckbcnmu@gmail.com
Dr. H. L. Tidke (Scheme Coordinator) – 09168595997 e-mail: tharibhau@gmail.com

Kavayitri Bahinabai Chaudhari North Maharashtra University * RGS&TC KBCNMU Center * Jalgaon-425001

4. If the terms & conditions are acceptable, the Cheque issued by University, maybe retained otherwise the same may be returned to the Finance & accounts officer, KBCNMU by Registered Post within 10 days from the receipt of the cheque.
5. The sanctioned amount shall be transferred to a separate account operated jointly by Principal Investigator and Principal.
6. The College shall maintain the proper accounts of the expenditure out of the grants which shall be utilized only on approved items of expenditure.
7. The grantee institution shall ensure the utilization of grant-in-aid for which it is being sanctioned/paid.
8. The grants utilization certificate, statement of expenditure and progress report on completion of the first year should be sent to **Prof. D. S. Patil,** Member Secretary, Committee of Peer and PAC, Director, School of Physical Sciences Kavayitri Bahinabai Chaudhari North Maharashtra University, PB 80, Jalgaon 425001 by **10-04-2023.**
9. Grants for the second year will be released only after the receipt of the grants utilization certificate, statement of expenditure, and satisfactory progress report. The release of funds as a second installment depends on the quality as well as the performance of work done at the first stage and the recommendation of the committee constituted for the said purpose. **Also, the release of funds as a second installment is subject to the grants received from RGS&TC, Mumbai.**
10. The assets acquired wholly or substantially out of RGS&TC grants shall not be disposed or encumbered of utilized for the purposes other than those for which the grant was given, without the proper sanction of the University and should, at any time the college ceased in function such assets shall revert to the University.
11. A register of assets acquired wholly or substantially out of the grant shall be maintained by the College in the prescribed form.
12. The appointment of staff is not permissible. Purchase of equipment/items should be made as per Government & University rules.
13. If the Principal Investigator is transferred from his/her original place of work to another institution, a NOC should be furnished as stated in guidelines.
14. If the Principal Investigator has published their Research paper in the National & International Journal, one copy of the paper should be submitted to the RGS&TC, KBCNMU Centre office. The acknowledgment of RGS&TC grants received through Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon is essential in the research paper for financial assistance.
15. The project completion report, CA audited grants utilization certificate and statement of expenditure in three copies along with CD should be sent to RGS&TC, KBCNMU Centre office by **10-04-2024** or within one month of completion, whichever is earlier.

Kavayitri Bahinabai Chaudhari North Maharashtra University RGS&TC KBCNMU Center Jalgaon-425001

(Prof. D. S. Patil)
Member Secretary, Peer & PAC
Member Secretary
Peer & PAC Committee, RGS&TC
Kavayitri Bahinabai Chaudhari
North Maharashtra University,
Jalgaon - 425001 (M.S.)

Copy forwarded for information and necessary action:

1) The Finance & Accounts Officer, KBCNMU, Jalgaon
   You are requested to transfer the amount of Rs. 0.85 lakh as 1st installment to the Principal.
2) **Dr. Sandip P. Patil (PI),** and **Mr. T. A. Shinde (Co-PI).**
3) Dy. Registrar, Vice-Chancellor Office, KBCNMU, Jalgaon.

Contact:
Prof. D. S. Patil (Member Secretary) – 09423515937 (O) – 0257 2257475 e-mail: rgstckbcnmu@gmail.com
Dr. H. L. Tidke (Scheme Coordinator) – 09168595997 e-mail: tharibhau@gmail.com

RGS&TC KBCNMU Center

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TECHNICAL ARTICLE

To study the effect of finishing chemicals on physical and chemical properties in terry towel

Tushar A. Shinde, Y. Dhangar

Centre for Textile Functions, MPSTME, NMIMS University, Shirpur

Leena N. Patil

Department of Chemistry, School of Science, Sandip University, Nashik

and

Sandip P. Patil

Department of Microbiology, R. C. Patel ACS College, Shirpur

Abstract

The cotton terry towel fabrics (Single pile, Double-pile and Zero twist terry towel) was dyed with various shades as per the standard method and softeners viz. cationic softener and silicone softener were applied. Physical properties like tearing strength, tensile strength, and chemical properties like wet- dry-core pH, water absorbency, rubbing fastness, washing fastness properties were evaluated and analysed. It was observed that after the application of softeners the absorbency of the terry towel was increased and simultaneously other properties like tearing strength and tensile strength were lost.

Keywords: Cationic, Silicone, Water absorbency, Tearing strength, Tensile strength

Introduction

Terry material is widely used for towels, home textile products, headgears, slippers, children's clothes, hygiene products for babies etc. Terry fabrics are produced using weft and warp yarns of cotton and bamboo because of their good water absorbency properties. Terry fabrics have similar structural parameter as produced by the weaving of warp yarn which is subjected to various finishing process commonly applied in the textile industry [1, 2]. Terry fabrics are also produced using weft, ground warp and pile warp yarns [3]. Although the yarn material is an important parameter in determining the water absorption properties of terry fabrics, pile characteristics also affect them and a lot of research has been carried out to study the construction of terry fabric that affects the water absorption properties of the material by finishing procedures like washing. Cotton terry towels are woven with cotton pile yarns. Desized woven terry towels without dye or any further finishing treatments are produced under industrial conditions [4]. The abrasion resistance of the ring towel is better than that of towel in both dry and wet state. The abrasion-resistant of fabric is significantly lowered on wetting and softening [5]. The research shows that the percentage of water absorption is the lowest for open-end yarn, and the highest for two-ply ring carded yarn the higher twist values used in the production of open-end yarn make water penetration inside open end weft densities as the terry fabric structure become dense, where it increases with an increase in pile height because of the increased pile warp yarn surface area. Softening is an important process in the finishing operations. A softener's main

Dyeing • Finishing • Printing • Coating

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Optimising the fixation of reactive dyes

By **Tushar A. Shinde**, **Dr Sachin M. Munde**, **Dr Leena N. Patil**, **Swapnil Mali**, **Dr Sandip P. Patil** and **Dr K. K. Gupta**

Abstract

Today, there are more than 10,000 dyes commercially available around the world and around 800,000 tonnes of dyes are produced annually. Dyes themselves have many varieties based on their structure, such as acidic, basic, azo, metal complex, vat and reactive dyes.

The reactive dyeing process requires large quantities of salt, such as sodium chloride, sodium sulphate and Glauber salt. It requires 50-100 gm/litre (gpl) of the salts to promote adequate exhaustion. It additionally uses large quantities of water for rinsing the dyed fabric, resulting in an average of 2,000-3,000 ppm of effluent. There have been recent attempts to lower levels of sodium chlorite in this process because many dyes are discharging at high levels; many dye manufacturers have developed a line of fibre-reactive dyes that require less salt to promote exhaustion. For the reactive dyeing of cotton fabric, we optimised (decreased and increased) the concentration of salt by 1%, 3% and 4% to observe the subsequent wash fastness, rub fastness and colour strength.

Keywords

- Colour strength
- Exhaustion
- Reactive dyes
- Rinsing
- Dyestuff

1. Introduction

In the reactive dyeing process, a covalent bond forms in between the dye molecule and the cotton polymer. The textile material attaches itself to the substrate via a chemical reaction that creates a covalent bond between the molecule of dye and the fibre. The first fibre reactive dyes were designed especially for cellulosic fibres and are mostly still used today; for protein and polyamide fibres, reactive dyes are commercially available. These dyes contain reactive groups that can be applied to a fibre in a weakly alkaline medium in a dye bath to encourage a chemical bond with the fibre. Reactive dyes can also be used to dye silk, wool and nylon (-NH2 group). In the latter case, they are applied under weakly acidic conditions, and a reaction occurs in an alkaline condition (pH>10).

For this project, we used a different concentration of the exhausting agent for the dyeing of cotton fabric with reactive dye, and the maximum fixation of various reactive dyes is used. It is our aim to achieve a specific depth of shade with a certain concentration of salt. It is important to see the effect of the concentration of salt on the exhaustion and dyeing of reactive dye, because salt plays a vital role as the catalyst that facilitates dyeing action. Salt has an extremely high affinity towards water. Broadly speaking, salt is necessary for three things: it drives the dye into the textile during the dyeing process; it helps to achieve the maximum exhaustion of dye molecules during the dyeing process in textiles; and it is used as an electrolyte for migration, absorption and fixation of the dyestuff to the cellulose material.

Johann Glauber was the first to produce Glauber salt, which he derived from Hungarian spring waters. The naturally-occurring salt is called mirabilite. Glauber's salt is a common name for sodium sulphate dehydrate (Na2SO4. 10H2O) and it occurs as white or colourless monoclinic crystals. Upon exposure to dry air, it forms a powdery anhydrous sodium sulphate. Glauber salt is water soluble, has a salty, bitter taste and is sometimes used in medicine as a mild laxative. It is also used in dyeing.

2. Materials and method

Fabric

The material used for the experiment was a 100% cotton terry towel double pile, procured from Deesan Dyeing Unit Shirpur, India. This terry towel is ready for dyeing (RFD).

Dye

Reactive dyes:

A. Company A: Colourtex, red XD2B
B. Company B: Jakazol, red TRL
C. Company C: Huntsman, red EC2BL

Machine

The following machinery was used in the project: a soft flow Thies dyeing machine (bulk scale); a spectrophotometer; a weighing balance; a fastness to crocking machine; a dryer; and an AHIBA dyeing machine (lab scale).

Several natural and skin-safe beauty products call for aloe vera gel. The clear, slimy pulp derived from the pea-green succulent plant has been used in health and beauty remedies for almost 2,000 years. Aloe-vera gel contains 99% water. The remaining 1% of its content is what makes all the difference. It contains essential vitamins like Vitamin A, C, E, B12 and folic acid that work as antioxidants against free radicals.

An enzyme called bradykinase found in aloe vera gel helps reduce excessive inflammation when applied topically on the skin. It also contains auxins and gibberellins, which are hormones that aid wound healing. The humble aloe vera gel contains a long list of minerals, namely calcium, copper, magnesium, potassium, sodium and zinc, which are essential for various bodily functions.

Development of antimicrobial textiles by using natural and ecofriendly agents

Tushar A Shinde, Sandip P Patil[1], Sachin M Munde[2] and Rajendra D Parsi

SVKM's, NMIMS University, MPSTME, Centre for Textile Functions, Shirpur 425405, Maharashtra

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Its fatty acid content adds to its antiseptic and analgesic properties; it can also be used to treat minor burns.

Coming to the beauty benefits, aloe vera gel stimulates fibroblast cells that produce collagen and elastin fibres, making the skin more elastic and less wrinkled. The amino acids in it also soften hardened skin cells and the zinc acts as an astringent to tighten pores.

The growing concern for global warming boosts the demand for organic products. With chemicals taking a toll on human health and environment, more and more people are becoming conscious of living life; the 'organic way'. Eco friendly clothing combining high quality clothing with socially conscious environmentalism has become a faction, and is in vogue. 'Green clothing' is made from hundred percent organic materials like soy, organic cotton and hemp. Variety of clothes like skirts, blouses, shirts, pants, socks, bathrobes, pillow cases etc. are made from organic fibres.

Antimicrobial textiles with improved functionality find a variety of applications in health and hygiene products.

Eco friendly fabrics embrace the body with a soft and supple touch. Eco friendly labels are now appearing on many products, due to the efforts of the companies to be perceived as environment friendly. Health concerns represent a potential source of benefits and demand for organic apparel. Hence, these garments are manifested as most important for children who are perceived to be more susceptible to toxins. Not only the fibres used for manufacturing the gar-

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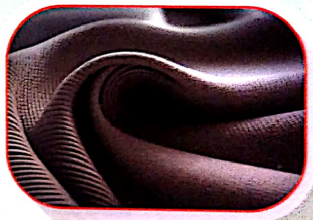
Reinforced Textile Composites



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Impact of tailing issue in chemical processing unit of textile industry

Tushar A. Shinde, Rajendra Parsi, Vijay S. Shivankar

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Sandip P. Patil

R. C. Patel Arts Commerce and Science College, Shirpur

Sachin M. Munde

Atma Malik Institute of Technology and Research, Shahapur

Abstract

In the textile processing industry, there are many problems during the process, out of them staining is also a very big issue. This stain problem occurs due to the D-graded and wasted fabric of about 18000 to 20000 meters per month. It is the most important factor in reducing this staining problem in the chemical processing department. Several precautions to prevent this problem have been discussed in this paper. Different types of stains were collected with detailed information. Based on the data of their sources, studied were conducted to correct stains by using some remedies. The stains are caused by majorly three things viz., machines, the concentration of chemicals and unskilled workers. Taking precautions measures and remedial actions, the stain was majorly reduced and the resulting the fabric was less wasted. It means the production rate of fabric somewhat increased, and the amount of reprocessing (RP Cost) was saved.

Key Words: Staining, Inspection department, Reprocessing, D-graded fabric

Introduction

The term or phrase "tailing" is referring to the progressive loss of dye concentration in the pad liquor throughout in continuous process. The shade gradually loses strength and becomes lighter or paler than the surrounding material. When the condition becomes critical at the time of applied depth is smaller and the dye substantivity is higher, the tailing effect is more noticeable. It has also been noticeable if the constituent dyes in a trichromatic combination vary considerably in substance because it appears as a gradual change in hue. In this process reactive dyes, altering dyeing equipment and procedures, chemically altering cotton fibre before dying, and utilising biodegradable organic compounds in effluent treatment procedures, it is possible to increase the sustainability of the dyeing process [1]. In accordance with the laboratory pad, stock tank, and pad liquor formulations must also be meticulously considered. The shade produced by bulk-scale running may be considerably paler or off-shade in comparison to the lab result, whereas the shade produced by lab-scale padding is like the shade of the first few meters dyed in bulk. To ensure that the pad liquor at equilibrium produces the desired shade on the finished goods. The cost-effectiveness of the dyeing process and strategies that assist

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Keratinase Enzyme Production from Bacillus Licheniformis KP9 Isolated from Chicken Feathers

Arun M. Patil[1], Jyoti P. Mahashabde[2], Leena P. Shirsath[3], Tushar A. Shinde[4], Sandip P. Patil[*3]

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Abstract: **The aim of the present study was to isolate keratinolytic bacteria from chicken feathers, since it is rich in keratin. Microbial keratinases have become biotechnologically important since they target the hydrolysis of highly rigid, strongly cross-linked structural polypeptide "keratin" recalcitrant to the commonly known proteolytic enzymes trypsin, pepsin and papain. The isolation of keratinolytic bacteria was performed by routinely used microbiological techniques and all the 11 isolates were screened for the keratinase production. The potent strain KP9 was characterized and identified by 16S r-RNA gene sequencing as *Bacillus licheniformis* KP9. The production of enzyme keratinase was studied by submerged fermentation process. The production of enzyme was optimized at various pH, temperature, incubation period and inoculum size. The maximum keratinase enzyme production by *Bacillus licheniformis* KP9 was recorded at pH 7.0, temperature 35°C, 3% inoculum size and 48 h of incubation period.**

Index Terms: **Keratinase, Chicken feathers, Production, Optimization, *Bacillus licheniformis*.**

I. Introduction

Microbial keratinase is the type of protease enzyme capable of degrading the insoluble structural protein found in feathers, hair and wool known as keratin. Keratin is a fibrous and insoluble structural protein extensively cross linked with hydrogen, disulphide and hydrophobic bonds. It forms a major component of the epidermis and its appendages viz. hair, feathers, nails, horns, hoofs, scales and wool (Anbu et al., 2007; Kim, 2007).This protein is resistant to degradation by proteolytic enzymes such as trypsin, pepsin, papain due to the composition and molecular conformation of the amino acids found in keratin (Mukherjee et al., 2008; Rai et al., 2010). Feathers are produced in large amounts as a waste by-product at poultry processing plants, reaching millions of tons per year worldwide. Feathers contain over 90% crude protein in the form of keratin.

Keratinases (EC.3.4.99.11) belong to the group of serine proteases capable of degrading keratin. It is an extracellular enzyme produced in a medium containing keratinous substrates such as feathers and hair. Keratinases have applications in traditional industrial sectors including feed, detergent, medicine, cosmetics and leather manufacturers (Farag and Hassan, 2004), they also find application in more recent fields such as prion degradation for treatment of the dreaded mad cow disease (Langeveld et al., 2003), biodegradable plastic manufacture and feather meal production. Hence the present study focuses on the production of enzyme keratinase. Because of the numerous potential uses of keratinases, this study was undertaken to screen a bacterium that produces a highly active keratinase.

II. Materials and Methods

A. Isolation of microorganisms

Samples of chicken feathers were collected from local poultry farms in Shirpur, India. The samples were inoculated for enrichment into the Luria-Bertani broth for 24 h at 37 °C. After the enrichment process, samples were plated on the Luria-Bertani agar plates for the isolation of individual organisms. The plates were incubated at 37 °C for 2 days until colonies appeared. Representative colonies were selected based on their morphology and colony colour. Selected colonies were isolated by transferring them on to the fresh LB agar plates (Suntomsuk and Suntomsuk, 2003).

[*] Corresponding Author

In-Vitro Antioxidant Activity, Acute Oral Toxicity Studies and Preliminary Phytochemical Characterization of the Bark Extract of *Terminalia arjuna* (L.)

Samadhan G. Patil[1], Bhushan S Bhadane[1], Mohini P. Patil[1], Sateesh Belemkar[2] and Ravindra H. Patil[1,*]

[1]*Department of Microbiology and Biotechnology, R. C. Patel Arts, Commerce and Science College, Shirpur 425405 (MS), India*

[2]*Department of Pharmacology, SVKM NMIMS, School of Pharmacy and Technology Management, Shirpur 425405 (MS), India*

Abstract: The free radicals and the reactive oxygen species (ROS) are known to induce oxidative stress and it has been implicated in the pathology of cardiovascular diseases, inflammatory conditions, cancer and ageing. The activities associated with ROS can be delayed, prevented or removed by antioxidant compounds (natural or synthetic). The use of synthetic antioxidants restricted because of their known side effects such as liver damage and carcinogenesis. The aim of this study to evaluate *in vitro* antioxidant and acute oral toxicity of *Terminalia arjuna* extracts. The present finding reveals that the purified fraction at100 µg/ml, showed maximum (91.32 ± 0.10 %,) DPPH radical scavenging effect in comparison with standard ascorbic acid (79.46 ± 0.10%) at the 10 µg/ml concentration. The reducing power of the purified extract was found to be dose dependent. Food and water intake of the animals in test and control groups was found normal during the 14 day acute oral toxicity studies and no apparent changes were observed in the internal organs of both, the test and control groups, after gross necropsy. The preliminary phytochemical screening of the crude acetone extract revealed dominant presence steroids, terpenoids, polyphenols, alkaloids and tannins. TLC profile of the purified fraction revealed a single band of R_f 0.38, a characteristic feature of triterpenoids. The UV absorption maximum of the purified fraction was recorded at 194nm. The FT-IR spectrum indicated presence of aromatic rings 3421 (COOH), 2957 (alkanes, CH_2 and CH_3), 1726 (carbonyl), 1599 (carboxylic acid), and region between 1000-1300 stretching of C-O, ester and ether carboxylic group. Thus, the isolated bioactive phytoconstituents form the bark extract of *Terminalia arjuna* could be used as natural anti-oxidants.

Keywords: Antioxidant activity, Acute oral toxicity, *T. arjuna*, TLC, Triterpenoids.

INTRODUCTION

Free radicals and reactive oxygen species (ROS) generated in the biological system are the major cause of the degenerative conditions such as aging, cancer, inflammation and atherosclerosis [1]. Hydroxyl radical (OH^-), superoxide anion (O_2^-) and nitric oxide (NO^-) are known to cause membrane damage, protein denaturation and lipid peroxidation. Natural antioxidant enzymes present in the body as well as dietary intake of antioxidants circumvents free radicals and reactive oxygen species generated in the body. Antioxidants also have the ability to prevent the oxidative stress generated by the reactive oxygen species and consequently the free radical mediated oxidative damage in the cell [2]. Sufficient amounts of exogenous antioxidants are required to reduce the damage caused by free radicals and reactive oxygen species. Therefore, there is great need to search for safe, less cytotoxic and chemo-preventive natural antioxidants. Antioxidant potential of medicinal plants attributed by the bio-active compounds present in it. Medicinal plants are rich source of diverse secondary metabolites having potential to reduce reactive oxygen species and thus widely recognized for their pharmaceutical and medicinal importance. A number of clinical studies have reported that antioxidants of plant origin such as polyphenols, flavonoids, terpenoids, tannins etc. are reported to reduce the oxidative stress in the biological system [3].

Indian traditional system of medicine has identified a large numbers of plants for their antioxidative potential and human diseases. Medicinal plants such as *Celatrus peniculatus*, *Carrisa carrandus, Achyrahes aspera*, *Cassia auriculata*, *Coccinia indica*, *Mentha spicata, Hygrophilla auriculata*, *Datura stramonium, Delonix regia, Coriandrum sativum* and *Pterospermum acerifolium* are known to have antioxidant activities [4]. *Terminalia arjuna* (Combretaceae), commonly known as Arjun tree, is a large deciduous tree known for its cardioprotective role. The bark of *T. arjuna* has been recommended and used as a cardiac tonic and bark

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