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Tiruchengode – 637 205, Namakkal dt., Tamilnadu

DEPARTMENT OF MICROBIOLOGY

Students MiniProject - 2022-2023

Degree / Branch / Year / Semester: B.Sc Microbiology/III/V

Academic year: 2022-2023

S.NO	ROLL.NO	NAMER OF THE STUDENT	Title of the Project
1	20UMB1309	BOOBALAN S	Degradation of Navy blue dye
2	20UMB1310	BOOPATHY S	Degradation of Navy blue dye
3	20UMB1311	DEEPAK M	Degradation of Navy blue dye
4	20UMB1312	DHANUSKUMAR S	Degradation of Navy blue dye
5	20UMB1313	DINESH KUMAR R	Microbial load in fermented rice
6	20UMB1314	HARIHARAN S	Microbial load in fermented rice
7	20UMB1315	KARTHICK RAJA S	Microbial load in fermented rice
8	20UMB1316	KARTHICK S	Microbial load in fermented rice
9	20UMB1317	MEIYARASAN P	Microbiological quality of Water
10	20UMB1318	MUKESH U G	Microbiological quality of Water
11	20UMB1320	RAJASEKAR B	Microbiological quality of Water
12	20UMB1321	SARATHI R	Microbiological quality of Water
13	20UMB1323	SATHISH KUMAR R	Microbiological quality of Water
14	20UMB1324	SATHISH KUMAR S	Parasitic contamination of fruits and vegetables
15	20UMB1326	SURYA A	Parasitic contamination of fruits and vegetables
16	20UMB1327	THIRUMOORTHI M	Parasitic contamination of fruits and vegetables
17	20UMB1328	VIGNESH P	Parasitic contamination of fruits and vegetables
18	20UMB1330	DEEPIKA M	Antibacterial activity of Guava
19	20UMB1332	GOWSALYA G	Antibacterial activity of Guava
20	20UMB1333	GOWSIKA V	Antibacterial activity of Guava
21	20UMB1334	HEMALATHA M	Antibacterial activity of Guava
22	20UMB1335	INTHUJA V	Antibacterial activity of Guava
23	20UMB1336	JEEVADHARSHINI S	Antimicrobial activity of garlic extract
24	20UMB1337	KATHIJA J	Antimicrobial activity of garlic extract
25	20UMB1338	MYTHILI S	Antimicrobial activity of garlic extract
26	20UMB1339	SABITHA K	Antimicrobial activity of garlic extract

27	20UMB1340	SANDHIYA J	Antimicrobial activity of garlic extract
28	20UMB1341	SARANYA S	Antibacterial activity of Citrus fruits
29	20UMB1342	SHALINI S	Antibacterial activity of Citrus fruits
30	20UMB1343	SRINIDHI S R	Antibacterial activity of Citrus fruits
31	20UMB1344	SOWBARNAYA B	Antibacterial activity of Citrus fruits
32	20UMB1345	SUBHASRI M.T	Antibacterial activity of Citrus fruits
33	20UMB1346	SUGANESHWARI P	Antagonistic activity of soil
34	20UMB1347	SUNMATHI M	Antagonistic activity of soil microorganisms
35	20UMB1349	YOGALAKSHMI S	Antagonistic activity of soil microorganisms
36	18UMB1565	DEEPA M	Antagonistic activity of soil microorganisms
37	20UMB1348	TAMILSELVI M	Antagonistic activity of soil microorganisms

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TIRUCHENGODE - 637 205.

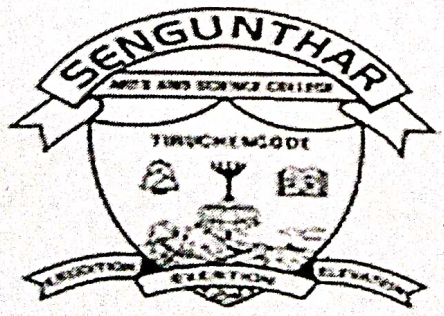
ANTIBACTERIAL ACTIVITY OF CITRUS FRUITS AGAINST SOME BACTERIAL PATHOGEN

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted by

**Ms.S.SARANYA,Ms.S.SHALINI,Ms.S.R.SHRINIDHI,Ms.B.SOWBARNIYA &
Ms.M.T.SUBHASRI**



DEPARTMENT OF MICROBIOLOGY

**SENGUNTHAR ARTS AND SCIENCE COLLEGE,
TIRUCHENGODE
NAMAKKAL-637205**

NOVEMBER-2022

CERTIFICATE

This is to certify that the entitled **"ANTIBACTERIAL ACTIVIY OF CITRUS FRUITS AGAINST SOME BACTERIAL PATHOGENS"** submitted in partial fulfillment of the requirement of the degree of BACHELOR OF SCIENCE IN MICROBIOLOGY to the PERIYAR UNIVERSITY,Salem is the record of bonafied research work carried out by Ms.S.SARANYA(Reg.no.20UMB1341),Ms.S.SHALINI(Reg.no.20UMB1342), Ms.SHRINIDHI(Reg.no.20UMB1343),Ms.B.SOWBARNIYA(Reg.no.20UMB 1344),Ms.M.T.SUBHASRI(Reg.no.20UMB1345) under my supervison and guidance, that no part of the project has been submitted for the award of any degree,diploma,fellowship or other similar title or prizes and that the work has not been published in part of full in any scientific popular journals or magazines.

Signature of the Head

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The Viva Voice Examination held on -26.11.22

External Examiners

1. 26/11/22
2. 26/11/2022

DECLARATION

I hereby declare the mini project entitled " **ANTIBACTERIAL ACTIVITY OF CITRUS FRUITS AGAINST SOME BACTERIAL PATHOGENS** " submitted to PERIYAR UNIVERSITY,Salem is partial fulfillment of the requirement to the award of the degree **BACHELOR OF MICROBIOLOGY,** is a record of original research work done by me under the guidance of **Dr. P.ASHOKKUMAR M.Sc.,Ph.D.,** Assistant Professor,Department of Microbiology,Sengunthar Arts and Science College,Tiruchengode and it has not formed that basic for the award of any Degree/ Diploma/ Associate ship/ fellowship or other similar title to any candidate of this University.

SIGNATURE OF SUPERVISOR
(Dr.P.ASHOKKUMAR)

SIGNATURE OF CANDIDATE
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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest gratitude to my Supervisor, **Dr. P.ASHOKKUMAR M.Sc., PhD.,** Assistant Professor, Department of Microbiology, for his constant encouragement, invaluable guidance, untailmg co-operation and keen interest evinced in my work helped to complete the thesis.

My profound thanks to **Dr. A.P.VENKATACHALAM, M.Sc., M.Phil, PhD,** Head of the Department, Department of Microbiology, Sengunthar Arts and Science College, Tiruchengode, for providing facilities to undertake the course of study.

I express my heart full thanks to our Principal Dr. P.RAVIKUMAR., M.Sc., M.Phil, Ph.D., and the Management of Sengunthar Arts and Science College, Tiruchengode, for the encouragement during the entire course of study.

T also wish to express my thanks to staff memberS of Sengunthar Arts and Science College, Tiruchengode. **Ms.T.NIVEDHARSINI., M.Sc.,** and **Mr.PRAKASH.,M.Sc M.Phil,** for their encouragement during the entire course of study.

I express my thanks to **Mr. K.P. GOPAL** and **Ms. D.SHANTHAKUMARI,** Technical staff for their timely help during my project work.

ANTIBACTERIAL ACTIVITY OF CITRUS FRUITS AGAINST SOME BACTERIAL PATHOGENS

INTRODUCTION:

Natural products such as plants have been integral part traditional medicine system in ancient such as Chinese, Ayurvedic and Egyptian [1]. Several published reports had described the antimicrobial activity of various crude extracts of plants either in single or in combination [2]. It has been estimated that about 2.5 million species of higher plants and their therapeutic values are yet to be determined. However, herbal extracts are becoming popular as natural medicine; preservatives and additives [3]. According to World Health Organization [4] medicinal plants contain substances in one of its organs such as stem, root, leaves, rhizomes, fruits, flower and seeds that can be used for therapeutic purposes or which are precursor for chemo-pharmaceutical semi-synthesis [4]. The medicinal plants are employed in the treatment or control of disease condition due to the presence of biochemical components called phytochemical [5]. Phytochemicals are considered as bioactive substances of plant origin and are of medical importance. They are otherwise known as secondary metabolites as they are of little important to the plant who manufactured them. These secondary metabolites synthesized naturally in various organs of plants such as leaves, stem, root, flower and seed [6]. Most of the modern drugs used today were originally obtained from plants [7]. Many researches confirmed the herbal extract boost immune system by stimulating the production of white blood cell which fight diseases [8]. *Citrus aurantifolia* belongs to Rutaceae, it is a polyembroyonic plant cultivated in several part of the world especially hot subtropical or tropical region such as India, USA, Nigeria, Mexico West indies and Egypt [9]. The plant is shrub in nature and height of about 2 meter tall, evergreen with dense and irregular branches which possess short and stiff spines. The *Citrus aurantifolia* fruits are ovoid berry of about 3-6cm in diameter and sometimes possess apical papilla. When ripe, the fruits turn yellow from initial blue [10]. The plant is used in traditional medicine for treatment of several diseases such as cold and stomach ailment. It can also be used as an antiseptic, mosquito repellant, antifungal, antibacterial and antiviral agent. The health benefits of *Citrus aurantifolia* plant are highly associated with the high amount of bioactive constituents it contained such as phenols, flavonoids, carotenoid, vitamins and minerals [11]. Limes contain unique flavonoid compounds that have antioxidant and anti-cancer properties. The flavonoids help to inhibit cell division in many cancer cell lines in addition to its antimicrobial efficacy [12]. The plant also demonstrated bioactive activities for cold, fever, sinusitis, sore throats, asthma and bronchitis [13]. Antibacterial assessment of *Citrus aurantifolia* aqueous ethanol, acetone, chloroform, ethanol and petroleum ether leaves extract

conducted by Pathan R et al. [14] against various pathogen showed significant activity against *Staphylococcus aureus*, Pseudomonas spp, Klebsiella pneumonia along with antifungal activity against Mucor spp., *Aspergillus fumigates* and *Aspergillus niger*. Kandpal et al. [15] isolated actinomycetes from C. aurantifolia and tested its antibacterial efficacy against different pathogen. In this study, five actinomycetes isolated from the plant exhibited antibacterial activity against various pathogens including *S. aureus*, *E. coli*, *K. Pneumonia* and *S. typhi*.

Medicinal plants are a rich source of lead compounds for traditional and modern medicines (16). Currently, clinical effectiveness of many antibiotics is compromised by the emergence of resistant pathogens. Therefore, there is a continuing and urgent need for the discovery of new antimicrobial sources. Herbal drugs are widely used in ethnomedicine due to their unknown bioactive compounds, low side effects, and relatively low costs (17). Accordingly, several studies have focused on medicinal plants to find more effective drugs against microbial infections (18,19). *Citrus medica* L. is a valuable medicinal plant used in Iranian ethnomedicine. It is a small plant, having short thorns and large and rectangular leaves with elliptical fruits. It is reported that *C. medica* extract plays a role in the treatment of diabetes and Alzheimer disease (20). The root extract of *C. medica* is used for its anthelmintic and antilithic properties in the treatment of urinary calculi in India (21).

It is known that plant oriented compounds such as carotenoids, phenolics, flavonoids, and ascorbic acid eliminate free radicals and have antioxidant and anti-mutagenic properties (22). Antimicrobial activity of saponin and tannins (23), alkaloids (24), and flavonoids have been reported (10). Therefore, differences in the sensitivity of bacteria to plant extracts could be either due to the intrinsic sensitivity of microorganisms, or the nature of compounds with antimicrobial properties such as alkaloids, tannins, saponins, phenols, glycosides, and flavonoids (25). Moreover, several parameters affecting the plant extract efficacy are extraction method, plant genotypes (26), the moisture content of the plant, and the temperature of the extraction time (27). As a result, the extraction method, extraction time, solvent and tissue type, as well as the plant species affect the presence and the amount of desired compounds in the extracts (28).

Citrus species are known for an abundance of bioactive components, nutraceuticals, and functional compounds in the flavedo and albedo of the peels. In Citrus fruits, flavonoids are present as flavanones (neohesperidosides, rutinosides), flavanol glycosides, flavones (polymethoxyflavones, hydroxylated polymethoxyflavones) with predominant bioactive compounds like naringin and hesperidin (2). Phenolic compounds like flavonoids are known to exhibit antioxidant, antiatherogenic, anti-inflammatory, anti-carcinogenic, antiviral, antimicrobial and antiallergenic activities (6)

actinomycetes isolated from the plant exhibited antibacterial activity against various pathogens including *S. aureus, E. coli, K. Pneumonia and S. typhi*. Minimum inhibitory concentration of aqueous and ethanol extracts of *Citrus aurantifolia* leaves showed dilutions of various concentrations of aqueous and ethanol of the extracts can inhibit and/or kill the isolates.

Conclusion

Phytochemical screening of leaves extracts of *Citrus aurantifolia* indicated the presence of alkaloid, flavonoid, glycoside, saponin, steroid, phenols, terpenoid and tannin in both aqueous and ethanol extracts. The antibacterial efficacy of the extracts against the test isolates showed that the leaves extracts demonstrated an antimicrobial effect against the isolates. The Minimum inhibitory Concentration (MIC) of aqueous and ethanol extract showed dilutions of various concentrations of the extracts can inhibit and/or kill the isolates. The finding of this study supported the use of *Citrus aurantifolia* leaves extracts for medicinal purpose.

PARASITIC CONTAMINATION OF FRUITS AND VEGETABLES COLLECTED FROM SELECTED LOCAL MARKETS OF TIRUCHENGODE

Mini project submitted in partial fulfillment
of the requirement for the Degree of

BACHELOR OF SCIENCE IN MICROBIOLOGY

Submitted by

Mr. S.SATHISH KUMAR (20UMB1324)

Mr. A.SURYA. (20UMB1326)

Mr. M.THIRU MOORTHI. (20UMB1327)

Mr. P.VIGNESH. (20UMB1328)

DEPARTMENT OF MICROBIOLOGY

SENGUNTHAR ARTS AND SCIENCE COLLEGE

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NOVEMBER -2022

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Assistant Professor Dept of Microbiology
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Tiruchengode-637205

CERTIFICATE

is to certify that the entitle **"PARASITIC CONTAMINATION OF FRUITS AND GETABLES COLLECTED FROM SELECTED LOCAL MARKETS OF RUCHENGODE"** Submitted in partial fulfillment of the requirement of the degree of helor of Science in Microbiology to the Periyar University, Salem is the record of bonafied earch work carried out by **(S.SATHISH KUMAR,A.SURYA,M.THIRU ORTHI,P.VIGNESH)** under my supervision and guidance, that no part of the project has n submitted for the award of any degree, diploma, fellowship or other similar titles or prizes that the work has not been published in part of full in any scientific popular journals or gazines

A.P. 25/11/22

SIGNATURE OF HEAD

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TIRUCHENGODE - 637 205, (TKD),

A.P. 25/11/22

SIGNATURE OF GUIDE

bmitted for viva voce examination held on 26.11.2022

ternal Examiners

26/11/22

26/11/2022

DECLARATION

I hereby declare the mini project entitled **"PARASITIC CONTAMINATION OF FRUITS AND VEGETABLES COLLECTED FROM SELECTED LOCAL MARKETS OF TIRUCHENGODE "** Submitted to Periyar University, Salem is partial fulfillment of the requirement to the award of the degree Bachelor of Science in Microbiology, is a record of original research work done by me under the guidance of **Dr.P.VENKATACHALAM M.Sc., M.Phil., Ph.D.,** Assistant Professor, Department of Microbiology, Sengunthar Arts and Science College, Tiruchengode and it has not formed that basic for the award of any Degree/Diploma/Associate ship/Fellowship or other similar title to any candidate of this university.

Guide and Supervisor

(Dr. P.VENKATACHALAM).

Signature of candidates

Mr. S.SATHISH KUMAR (20UMB1324)

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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest to my supervisor, **Dr. P.VENKATACHALAM M.Sc., M.Phil., Ph.D.,** Assistant Professor, Department of Microbiology, for his constant encouragement, invaluable guidance, unfailing co-operation and keen interest evinced in my work helped to complete the thesis

My profound to **Dr. P.ASHOK KUMAR M.Sc., Ph.D.,** Assistant Professor Department of Microbiology, Sengunthar Arts and Science College, Tiruchengode, for the encouragement during the entire course of study.

I also wish to express my thanks to staff members of Sengunthar Arts and Science College, Tiruchengode. **Ms. T.NIVEDHARSINI M.Sc., M.Phil. and Mr.T.R.PRAKASH M.Sc., M.Phil.**, For their encouragement during the entire course of study.

I express my thanks to **Mr. K.P. GOPAL** and **Mrs. D.SHANTHAKUMARI**, Technical staff for their timely help during my project

S.SATHISH KUMAR

A.SURYA

M.THIRU MOORTHI

P.VIGNESH

PARASITIC CONTAMINATION OF FRUITS AND VEGETABLES COLLECTED FROMSELECTED LOCAL MARKETS OF TIRUCHENGODE

Introduction

Intestinal parasitic infections are widely distributed through- out the world causing substantial intimidation to the public health, economy, and physical and cognitive development particularly among children in developing countries like Ethiopia. The poor personal hygiene, poor environmental hygiene, and poor health system commonly observed in developing countries make the prevalence to be highestamong these populations [1, 2].

The consumption of fruits and vegetables helps in pro- tecting human body from a number of diseases by providingnutrients, vitamins, minerals, protein, and fibers. It could also have a positive impact on body-weight regulation and related conditions, including diabetes and hypertension. However, fruits and vegetables, especially, those that are consumed rawand or not properly washed, have been the major way for the transmission of human pathogens [3–5].

Intestinal parasitic infection may be acquired in different ways like by consumption of contaminated fruits, vegetables, other food stuff, and water [6]. Eating unclean, raw, or undercooked fruits and vegetables is one of the means by which the transmission of intestinal parasitic infections is propagated [7]. Fruits and vegetables act as vehicles for the transmission of parasitic infections when contaminated as a result of various associated factors related to planting, such as while they are still on the field, harvesting, transportation, storage, market chain, and even at home [5, 8].

Despite the fact that intestinal parasitosis is common in namakkal [9, 10], there are no studies conducted to assess the level of contamination of fruits and vegetables with parasites of medical and zoonotic importance. If our target is to control the intestinal parasitic diseases, it is not enough to depend merely on the chemotherapeutic intervention of identified cases, but need the concerted effort to reduce and eliminate the potential sources of infection. To ourknowledge there is no published document to attest the level of parasitological contamination of fruits and vegetables in namakkal.. Therefore, this study was designed to determine the level of parasitic contamination of selected fruits and vegetables and associated factors in namakkal.

Conclusion

In conclusion, this study highlighted the importance of raw fruits and vegetables as the potential source of transmission for intestinal parasites to humans. The fruits and vegetables contamination with the pathogenic parasites poses health risk to the consumers if consumed without proper cleaning and or cooking. Prevention of contamination remains the most effective way of reducing food borne parasitic infection. A comprehen- sive health education should be given to vendors and farmers of fruits and vegetables and to the general population on the health risks associated with consumption of contaminated fruits and vegetables. The consumers should always observe the basic principle of food and personal hygiene, that is, thorough washing of the fruits and vegetables before eating and washing hands before meal. The vendors of fruits and vegetables should avoid the contact of the produces with soil while display for selling. Further studies should be conducted on the viability of parasitic contaminants of fruits and vegetables. Also, other researches must be done to evaluate the level of parasitic contamination of farm produces, water, and soil in which fruits and vegetables are cultivated. These studies should also be conducted in different regions of the country.

DEGRADATION OF NAVY BLUE DYE BY BACTERIA ISOLATED FROM TEXTILE DYE EFFLUENT

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted by
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NAMAKKAL-637205

NOVEMBER-2022

CERTIFICATE

This is to certify that the entitled **"DEGRADATION OF NAVY BLUE DYE BY BACTERIA ISOLATED FROM TEXTILE DYE EFFLUENT"** submitted inpartial fulfillment of the requirement of the degree of BACHELOR OF SCIENCE IN MICROBIOLOGY to the PERIYAR UNIVERSITY,salem is the record of bonafied research work carried out by**Mr.B.BOOBALAN(20UMB1309),Mr.S.BOOPATHI(20UMB1310) Mr.M.DEEPAK(20UMB1311)Mr.S.DANUSHKUMAR(20UMB1312)** under my supervison and guidance, that no part of the project has been submitted for the award of any degree,diploma,fellowship or other similar title or prizes and that the work has not been published in part of full in any scientific popular journals or magazines.

Signature of the Head

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DEPARTMENT OF MICROBIOLOGY,
KONGUNTHAR ARTS & SCIENCE COLLEGE
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Signature of the Guide

Submitted for viva voce examination held on 26.11.2022

External Examiners

1.

2.

DECLARATION

I here by declare the mini project entitled " **DEGRADATION OF NAVY BLUE DYE BY BACTERIA ISOLATED FROM TEXTILE DYE EFFLUENT"** submitted to PERIYAR UNIVERSITY,Salem is partial fulfillment of the requirement to the award of the degree **BACHELOR OF MICROBIOLOGY,** is a record f original research work done by me under the guidance of **Mr.T.R.PRAKASH M.Sc.Mphil.,** department of microbiology,sengunthar arts and science college,tiruchengode and it has not formed that basic for the award of any Degree/ Diploma/ Associate ship/ fellowship or other similar title to any candidate of this University.

GUIDENANCE SUPERVISOR

[Mr.T.Prakash]

SIGNATURE OF CANDIDATE

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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest gratitude to my Supervisor, **Mr.T.R.PRAKASH M.Sc.,Mphil.,** Department of microbiology, for his constant encouragement, invaluable guidance, unfailing co-operation and keen interest evinced in my work helped to complete the thesis.

My profound thanks to **Dr. A.P.VENKATACHALAM, M.Sc., M.Phil, PhD**, Head of the Department, Department of Microbiology, Sengunthar Arts and Science College, Thirucengodefor providing facilities to undertake the course of study.

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I also wish to express my thanks to staff members of Sengunthar Arts and Science College, Tiruchengode **Dr.P.ASHOKKUMAR M.Sc.,PhD.,** Assistant Proffessor of Microbiology and **Mrs.M.NIVEDHARSINI.,MSc.,M.Phil**,encouragement during the entire course of study.

I express my thanks to **Mr.K.P.GOPAL** and **Mrs.D.SHANTHAKUMARI**, Technical staff for their timely help during my project work.

1.INTRODUCTION

The textile industry is one of the industries that generate a high volume of waste water strong color of the textile waste water is the most serious problem of the textile waste effluent. The disposal of these waste into receiving causes damage to the environment dyes may significant affect photosynthetic activity aquatic habitat because of reduce light penetration may also be toxic to some aquatic life due to the presence of aromatics metals chlorides and other toxic compounds (Husseiny, 2008).

The removal of dyes from effluent is important due to their mutagenicity and carcinogenicity together with their intense coloration. Both physiochemical and biological methods for the removal of dyes have been investigated widely. The present study was focused on decolourization and biodegradation of textile effluent by using bacteria isolated from textile dye effluent.

1.1 DYE

Dye can be said to be colored, ionizing and aromatic organic compounds which shows an affinity towards the substrate to which it is being applied. It is generally applied in a solution that is aqueous. Dyes may also require a mordant to better the fastness of the dye on the material on which it is applied.

Dyes are applied to numerous substrates for examples of the textiles leather, plastic paper etc., in liquid form. One characteristic of dye is that the dyes must get completely or atleast partially soluble in which it is being put to the rule that we apply to other chemicals is similarly applicaple to dye also.

7. SUMMARY AND CONCLUSION

Increasing industrialization and urbanization leads to environmental pollution. The discharge of toxic effluents from various industries adversely affect water resources, soil fertility, aquatic organisms and ecosystem integrity. Among various industries, the textile dyeing industries discharge large volume of waste water after the dying process. Wastewater from textile industry is a complex mixture of many polluting substances ranging from organochloride based waste pesticides to heavy metals associated with dyes and dyeing process.

Textile effluent samples were collected from different dying unites near Erode and Salem. Two isolates were isolated. Using plate assay method the decolourization activity of bacteria was detected. Among the eight isolates two organisms showed the decolourizing activity and they are *Pseudomonas sp* ,*Bacillus sp.*

These organisms were identified using various tests and compared with Bergey's manual. For the degradation study, the isolated organisms were inoculated on Mineral Salt Medium containing the dye Navy Blue Dye Under stationary conditions, the decolorization was studied.

The maximum decolourisation was obtained stationary condition. The present study confirms the ability of *Pseudomonas sp* to decolorize the Direct Navy Blue GL with decolourization efficiency of 85% under stationary condition. Followed by this *Pseudomonas sp*

ANTIMICROBIAL PROPERTIES OF GARLIC EXTRACT

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted by

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S. MYTHILI	**(20UMB1338)**
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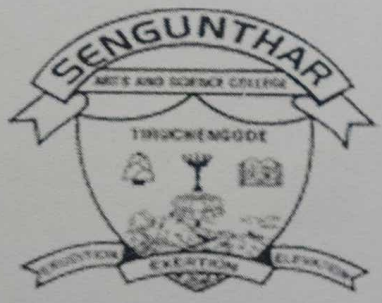

DEPARTMENT OF MICROBIOLOGY

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is is to certify that the entitle **"ANTIMICROBIAL PROPERTIES OF GARLIC EXTRACT"** Submitted partial fulfillment of the requirement of the degree of Bachelor of Science in Microbiology the Periyar University, Salem is the record of bonafied research work carried out by **Is. S. JEEVADHARSHINI, J.KATHIJA, S. MYTHILI, K. SABITHA, J. SANTHIYA** under my upervision and guidance, that no part of the project has been submitted for the award of any egree, diploma, fellowship or other similar titles or prizes and that the work has not been ublished in part of full in any scientific popular journals or magazines

A.P. 28/11/22

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Submitted for viva voce examination held on 26/11/2022

External Examiners

1 26/11/22

2 26/11/2022

DECLARATION

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Guide

(Ms. T.NIVEDHARSHINI)

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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest to my supervisor, **Ms.T.Nivedharshini M.Sc., M.Phil.**, Department of Microbiology, for his constant encouragement, invaluable guidance, unfailing co-operation and keen interest evinced in my work helped to complete the thesis.

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I express my thanks to **Mr. K.P. Gopal** and **Mrs. D.Santhakumari**, Technical staff for their timely help during my project.

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ANTIMICROBIAL PROPERTIES OF GARLIC EXTRACT

1.INTRODUCTION

Allium sativum (Garlic) has been grown on a massive scale on all continents for thousands of years. The species is one of the oldest vegetables cultivated by man not only for its specific taste and smell but for its therapeutic properties. The presence of many biologically active substances in garlic, especially in its underground bulb, makes the plant suitable for use in alternative medicine. Additional, due to the new challenges facing contemporary medicine, the therapeutic activity of the species is being studied and the plant is increasingly being applied in treatment (Bongiorno et al.2008; Block 2010).

The properties of Garlic are associated with its extremely rich composition. It contains approximately 33 sulfur compounds, 17 amino acids, enzymes, mineral salt (e.g. germanium, selenium, phosphates, calcium and iron salt), vitamins (e.g. ascorbic acid , riboflavin, niacin, thiamine, folic acid),and valuable essential oils (Block 1985,2010; Josling 2005;Ariga and seki 2006; najda et al. 2016;tch orzewska et al.2017). Garlic is estimated to contain over two hundred chemical substances that can protect the human organism against various diseases (Gebreyohannes and Gebreyohannes 2013).

To date, Garlic extract has been shown to exert potent therapeutic effects in the treatment of cardiovascular diseases, e.g. hypertension and high serum cholesterol levels (McMahon and Vargas 1993; Silagy and Neil 994; Yeh et al. 2006; Capraz et al.2006). Moreover, studies conducted in a rabbit model have demonstrated that long-term administration of Garlic extract reduces atherosclerotic plaque(Bordia 1981).additional ,garlic components have been reported to lower the level of fibrin in blood can thus prevent myocardial infarction (Ernst1994;Fukao et al 2007)

Investigations of the antiviral properties of the plant indicate that the garlic extract is effective in the treatment of e.g. herpes simplex virus types 1 and 2, coxsackie virus species, influenza B, para-influenza virus type 3, vaccinia virus, vesicular stomatitis virus ,human

5.CONCLUSION

Based on antimicrobial activity that *Staphylococcus aureus and E.coli* inhibiting that activity at that concentration of 150µl, so concluded that above result that Garlic extract was having antimicrobial activity on that *Staphylococcus aureus and E.coli* and then further study to identify the minimal inhibiting concentration and concentration level of inhibitory action.

MICROBIOLOGICAL QUALITY AND CONTAMINATION LEVEL OF WATER SOURCES IN PARAMATHI REGION, NAMAKKAL DISTRICT

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted

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MICROBIOLOGICAL QUALITY AND CONTAMINATION LEVEL OFWATER SOURCES IN PARAMATHI REGION, NAMAKKAL DISTRICT

INTRODUCTION

Water is an important component of every life [1–4]. Watersupply and accessibility is goal 6 of the sustainable development goals (SDGs) and aims at ensuring environmental sustainability [3, 4]. Historically, efforts to ensure access tosafe drinking and food processing water have been focused on the community based water sources [5, 6]. Most regions of the developing nations are experiencing shortage of potable water supply as improved water sources are only limited to urban areas [7]. Water sources that include both surface and ground water sources [8, 9]. In a bid to promote healthy living among inhabitants of the county, a reliable potable water access is essential for sustainable development, health, food production, and poverty alleviation [4, 10]. Water shortage and pollution of the readily accessible water sources are evident in many regions of the developing nations [3, 6, 11]. This is largely attributedto low level of personal hygiene and inadequate treatment facilities for water and wastes that are consequent pollutants [12]. Increase in population has exerted more pressure on the available water sources. Consequently, more than 1.2 billionpeople worldwide do not have access to safe water [13–15].Millions of people die yearly from diarrheal disease and a larger proportion are children aged below 5 years [16]. Besidescausing death, water-related diseases also prevent people from working and living active lives [17].

Water is susceptible to contamination with microorgan- isms and organic matter among other pollutants regardless of the source [3, 11, 18]. Significantly, microbial contami- nants such as coliforms, *E.coli*, *Cryptosporidium parvum*, and *Giardia lamblia* compromise the safety of the water [19]. Pres- ence of *Escherichia coli*, *Klebsiella,* and *Enterobacter* species in water is a likely indicator of the presence of pathogenic organisms such as *Clostridium pafringens*, *Salmonella,* and Protozoa [18]. These pathogens cause diarrhea, giardiasis, dysentery, and gastroenteritis, which is common among therural dwellers of developing nations [2, 3, 8, 20–22].

Ground water is dominant over surface water and is less susceptible to bacterial pollution.

CONCLUSION

Water security and safety is of vital concern in arid and semiarid regions of Tamilnadu. Potable water accessibility and supply is limited due to fluctuating climatic conditions and environmental pollution that lower the wholesomeness of most water sources. The aim of this study was to establish the suitability of these water sources for drinking and use in industrial food processing by the small and medium enterprises (SME's). The aim of this study was to establish suitability of these water sources for drinking and use in industrial food processing by the small and medium enterprises (SME's). Enumeration of E.coli, Staphylococcus aureus, Clostridium pafringens, Coliforms, and cysts. Surface, ground, and chlorinated urban water sources in Isiolo were contaminated with bacteria and cysts to levels regarded as unsafe as per the standards for potable water. Thismakes the water sources unsafe for direct drinking and use in food processing. Acceptability of solar use in powering boreholes pumps and solar drying of agricultural produce has increased recently and solar water disinfection technologies might not be an exception. This would minimize health risk associated with other chemical disinfection methods and save on biofuelconsumption in the form of firewood for boiling water as well.

ANTIBACTERIAL ACTIVITY OF PSIDIUM GUAJAVA PLANT EXTRACT AGAINST CITRUS BACTERIAL CANKER CAUSED BY *XANTHOMONAS SPECIES*

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted by

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The viva voice Examination held on- 26.11.2022

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DECLARATION

I here by declare the mini project entitled "**ANTIBACTERIAL ACTIVITY OF PSIDIUM GUAJAVA PLANT EXTRACT AGAINST CITRUS BACTERIAL CANKER CAUSED BY *XANTHOMONAS SPECIES*"** submitted to PERIYAR UNIVERSITY,Salem is partial fulfillment of the requirement to the award of the degree **BACHELOR OF MICROBIOLOGY,** is a record f original research work done by me under the guidance of **Mr.T.R.PRAKASH M.Sc.Mphil.,** department of microbiology,sengunthar arts and science college,tiruchengode and it has not formed that basic for the award of any Degree/ Diploma/ Associate ship/ fellowship or other similar title to any candidate of this University.

M. Deepika
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GUIDANCE SUPERVISOR

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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest gratitude to my Supervisor, **Mr.T.R.PRAKASH M.Sc.,Mphil.,** Department of microbiology, for his constant encouragement, invaluable guidance, unfailing co-operation and keen interest evinced in my work helped to complete the thesis.

My profound thanks to **Dr. A.P.VENKATACHALAM, M.Sc., M.Phil, PhD**, Head of the Department, Department of Microbiology, Sengunthar Arts and Science College, Thirucengodefor providing facilities to undertake the course of study.

I express my heart full thanks to our Principal **Dr.P.RAVIKUMAR M.Sc., M.Phil,.Ph.D.,**and the Management of Sengunthar Arts and Science College,Tirucengode for the encouragement during the entire course of study.

I also wish to express my thanks to staff members of Sengunthar Arts and Science College, Tiruchengode **Dr.P.ASHOKKUMAR M.Sc.,PhD.,** Assistant Proffessor of Microbiology and **M s.M.NIVEDHARSINI.,MSc.,M.Phil**,encouragement during the entire course of study.

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1. INTRODUCTION

1.1. CITRUS CANKER

Citrus bacterial canker (CBC) caused by *Xanthomonas citri pv citri* (Hasses) (Xac) is a wide spread disease in citrus producing area of the tropic and subtropics. It is a serious disease of most commercial citrus cultivars and species (Civerola, 1984). The disease is present in Asia, Africa, North America, South America and Oceania (EPPO/CABI, 1997). Bacterial canker of citrus caused by *Xanthomonas axonopodis pv citri* is one of the most serious in citrus crops. It causes necrotic lesions on fruits, leaves and twigs. The symptoms are appearing on young leaves, twigs and fruits. The lesions at first are small slightly raised, round and light green spots later they become grayish, white rupture and appear corky with brown sunken centers. The margin of the leaves is often surrounded by a yellow halo (Sasitorn vudhivanchi, 2003).

Citrus canker caused by *Xanthomonas axonopodis pv citri* (Xc) (synonym *Xanthomonos campestris pv citri*) is a serious disease reducing the external quality of citrus fruits. It affects all types of citrus and severely infects on citrus aurantifolia (lime). Typical symptoms on leaves is a raised necrotic lesions surrounding with yellow halo but on fruit and steam halo seldom occurs (Chhalia Leksomboon *et al.,* 2001). Citrus canker caused by *Xanthomonos campestries pv. citri* is a common and endemic disease in many citrus growing countries through out the world (Hartung and Civesole, 1989) . The disease was originated from India, Indonesia and other countries in Asia (Semangun, 1994). In Indonesia and Malaysia citrus canker is one of the most important disease (Singh, 1980, Tri Joko, *et al.,* 2000).

Natural infections are known to occur on citrus hybrids, and on *Poncirus tripoliate, Fortunalla japonica, Fortunalla migarita, Severia bufolia and Swinglea glustinesa.* Two groups of strains with restricted host range have recently identified with pathotype A (Verniere *et al.,* 1998; sun *et al.,* 2000) and designated as A* and Aw. These are closely related to type A strain (Cubero and Graham 2002). The proposal has been *Xanthomones axonopodis citri* to pathotype A and to use *Xanthomonas axonopodis pv.aulrantifolil* for pathotype B and C (Vauterin *et al,* 1995). Despite the fact that these distinct names have been extensively and commonly used, the proposal has not been validated by the committee on taxonomy of plant pathogenic bacteria . so all strains considered as Xanthomonas campestris pv.citri. Another disease, citrus bacterial spot is

7. SUMMARY

- Samples were collected from infected citrus plant's part like leaves fruits and stem.
- Plant pathogens were isolated by spread plate method.
- Plant pathogens were identified by microscopic examination, cultural character and biochemical test.
- Antibacterial activity of medicinal plant (*Psidium guajava,*) extract was prepared by using
- chloroform, hexane, ethanol, diethyl ether.
- Antibacterial activity of medicinal plant was detected by zone of inhibition on *Xanthomonas campestris pv.citri.*
- In this *Psidium guajava* leaf extract prepared by chloroform ethanol hexane and diethyl ether solvents showed good results.
- Minimum inhibitory concentration of the plant extract against isolates was determined.
- Statistical analysis were performed for the medicinal plant treatment which showed that the treatment of citrus canker with the plant extract were significant.

8. CONCLUSION

In this study, we can conclude that, the chloroform, ethanol, hexane and diethyl ether extraction of *Psidium guajava* leaf powder at the concentration of 150µl can be recommended for the citrus canker disease. Further work on isolation and characterization of active compounds from *Psidium guajava* leaf would be highly beneficial for the treatment of citrus canker caused by Xanthomonas campestris pv.citri. The application of medicinal plants in the treatment of plant disease can minimize the environmental pollution by the chemicals and antibiotics.

ISOLATION,IDENTIFICATION AND CHARACTERIZATION OF ANTAGONATIC ACTIVITY PRODUCING BACTERIA FROM AGRICULTURAL SOIL

Mini project submitted in partial fulfillment
of the requirement for the Degree of

Bachelor of Science in Microbiology

Submitted by

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CERTIFICATE

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ACKNOWLEDGEMENT

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ISOLATION, IDENTIFICATION AND CHARACTERIZATION OF ANTAGONASTIC ACTIVITY PRODUCING BACTERIA FROM AGRICULTURAL SOIL

1.INTRODUCTION

The antibiotics are broadly distributed in the nature ,where they play main role in managing the microbial population of soil, water, compost, and sewage. Antibiotics are low molecular weight molecules that produced secondary metabolites ,mainly by microorganism that fount in the soil .Microbes which produce antibiotics in large amount that can survive for longer time than the other microbes which produced antibiotics in less amount. These antibiotics which produce by the microbes have been very beneficial and helpful for the treatment of many human and animal diseases caused by microbes like bacteria, fungi and protozoa. The bacteria present in soil can be rods,(bacilli), cocci (spherical),and spirilla(spirals) of which, bacillus are more in numbers than others bacteria. They are one of the major groups of soil bacteria and are widely distributed. *E.coli* is a gram negative straight rod shaped (*bacilli*)bacterium arranged singly or in pairs that is commenly found in the lower intestineof worm blooded organisms.These are the some important examples of antibiotics used in medical treatments are bacitracin,gramycidin s,polymyxin, and tyrotricidin produced by different bacillus species. Microbes have anti microbial properties that characterization of various antimicrobial substances as organic acid (lactic acid and formic acid),diacetyl, and hydrogen peroxide alone or in combination. And other antimicrobial subtances with antagonistic properties include biocides, probiotics, and sterilants. Plant disease critically endangered agricultural resources.In particular soil borne pathogens cause dramatic yield and economic losses,with fungi being the most aggressive pathogens. In the past few decades,chemical fungicides have had a critical role in controlling plant disease and increasing crop yield.Untilnow, suppression of soil borne pathogens mainly relied on chemical pesticides.However,recently,scientists have reported that long time use of chemical agents can cause advers effects,including environmental contamination,resistant plant pathogen out break,progressively greater production costs owing to the over expenditure on these chemicals,and even toxicity in human.

niger. Aspergillus niger is one of pathogenic fungi present in the environment,it is present in agricultural soil of plant and cause substantial aliments for plant that lead to huge crops yield loss.In this study, the antagonistic activity of *Klebsiella spp.,Escherchia coli,Bacillus spp.and Staphylococcus spp.*Bacteria was examined against *Aspergillus niger* pathogenic fungi isolated from agricultural soil by using disk diffusion agar technique.Bacterial cells were cultured and grown on sabouraud dextrose agar media.After that,bacterial and fungal colonies were purified to one type of each one.Subsequently,bacterial type was identified by gram satining kit and some biochemical tests such as lysine,urease,triple sugar iron and motility tests,while fungal type was identified by obseving it under the microscope.Finallty, the bacteria against fungi was examined by putting the cells of *Klebsiella spp.,Escherichia coli., Basillus spp.,Staphylococcus spp.*As antibiotic disk on streaked *Aspergillus niger* on Sabouraud Dextrose Agar plates and streaking bacterial cells and fungal cells half in half on Sabouraud Dextrose Agar. The results of this study proved that *Aspergillus niger* grew normally in the presence of *Klebsiella* while grew in presence of *Escherichia coli, Bacillus spp,* And *Staphylococcus spp.Klebsiella* might not produce any enzymes have the ability to dissolve the *Aspergillus niger* cell wall as chitinase enzyme while the different antagonistic activities of *Escherichia coli, Bacillus spp.,Staphylococcus sp* Despite the increasing number of scientific papers dealing with biological control,an insufficient number of products are available in the market.It is known that the efficiency of mycelial growth inhibition in vitro does not always correlated with bio control efficiency under natural condition.Further more, the production of antifungal metabolites may not be equally expressed under in vitro and natural soil condition.Hence,understanting the mechanisms of disease control may help to control soil borne disease efficiently.

It is known that some microorganisms of soil such as some bacterial and fungal species have efficient roles in plant as antagonists against pathogenic microorganisms.For example; *Escherichia coli* has antagonistic activity against *Aspergillus p.*were because they might produce chitinase enzyme at different rates.In conclusion,not all bacterial species of soil have antagonistic activity against pathogenic microorganisms in which *Klebsiella* had not antagonistic or activity was not able to be antifungal agent *Aspergillus niger.*where as *Escherichia coli,Bacillus spp.,Staphylococcus spp.*Had varies effects as antifungal growth agents according to the difference in the production of pathogenic fungal cell wall lytic enzymes. key words:

4.DISCUSSION

Antibiotic production is a quality of several types of soil microbes and may represnt a survival mechanism where organisms caneliminate copetition and colonize a niche.According to shinde,the *E.coli* ATCC8739 with 49.77% antagonistic activity show aginst ten fungal pathogens.Some of the soil bacteria showed antifungal properties because they produce chitins which may be a part of a lytic system that capable bacteria for living on hyphae as real growth substrate. *E.coli* was produced chintinase enzyme because of this chintinase *E.coli* dissolve the cell wall of the pathogenicfungus *F.oxysporum* which cause the wilt disease in cucumber.Along with the three strains of the bacteria, *E.coli* was found to be more effective as remaining two bacterial strains.It was observed that besides antagonistic properties of strain-1 also exhibited the capabilities to suppress the growth of test fungal species(*Penicillium notatum,P.chrysogenum,Aspergillus niger and F.flavus)* used in this study. This showed that strain-1 might have great ability to become an effective anti-fungal agent which is clearly shown in the figure 4, so the strain-1 is an antibacterial as well as anti-fungal agent. Strain-1 could be applied in agricuturalindustries, husbandry and medical fields.Even, more species of test fungi were neededin this testing in order to show the antifugal properties exhibited by strain-1.

MICROBIAL LOAD IN PERMENTED WHITE RICE

Mini project submitted in partial fulfillment
of the requirement for the Degree of

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Guide and Supervisor

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ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest and deepest to my supervisor, **Dr. P. VENKATACHALAM M.Sc.,M.Phill.,Ph.D.,** Assistant Professor, & Head of the Department of Microbiology, for his constant encouragement, invaluableguidance, unfailingco-operation and keen interest evinced in my work helped to complete the thesis

My profound to **Dr. P. ASHOKKUMAR M.Sc.,Ph.D.,**Assistant Professor Department of Microbiology, Sengunthar Arts and Science College, Tiruchengode, for the encouragement during the entire course of study.

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I express my thanks to **Mr. K.P. GOPAL** and **Mrs. D.SHANTHAKUMARI**, Technical staff for their timely help during my project

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MICROBIAL LOAD IN FERMENTED WHITE RICE

1.INTRODUCTION

Probiotics are live microorganisms used as food supplements, which provide health benefits when consumed, through improving the intestinal microbial balance of the host (Fuller, 1989).They are live microorganisms which when administered in adequate amounts confer health benefits on the host (FAO-WHO, 2001). Microorganisms commonly used asprobiotics include *Bifidobacteria, Lactobacilli* and certain yeasts. Research has shown that addition of probiotics to food provides many a health benefit. They are able to increase the frequency of bowel movements (Bekkali *et al.,* 2007) and stimulate cell-mediated immunity (Wold, 2001). Moreover, *Lactobacillus acidophilus* L1 has shown the ability to reduce serum cholesterol level indicating the potential of reducing the risk for coronary heart disease by 6% to 10% in hypercholesterolemic human (Anderson *et al*., 1999). *L. Rhamnosus* GG has shown anti-carcinogenic effects through decreasing the activity of β-glucuronidase (Nicole and Martjjn, 2000). Fermentation is one of the primary methods of adding value to food including improving palatability, safety, shelf life and nutritional value.This process could also be applied in the production of functional foods such as probiotic food (Salovaara and Simson, 2004).

The fermentation process is widely used for preservation of food, particularly in developing countries (Lei, 2006). Yoghurt rice, "*dosa*", "*idli*" and hoppers are some examples of fermented rice products that constitute traditional Indian and Sri Lankan food (Wickramanayake, 2002). In the past, a vast majority of the farming community in Asian regions used to consume fermented rice for breakfast. This type of diet was known to provide adequate nutrition. The soothing effects of such meals were also well known. Fermented rice-milk beverage products show unique flavour, good taste and milky colour where *L.acidophilus* and *Streptococcus thermophillus* are used as starter cultures with rice steep liquor-milk (Yong-Jin *et al*., 2010). Production of primary metabolite, lactic acid and resultant decrease in pH is identified as the main preserving factor in fermentation of food (Jagadeeswari *et al*., 2010).

Cereal constituents such as wheat bran-based ingredients fermented with

probiotic, enhance the consumer health with the benefits of probiotics, bran fibre, and healthful bioactive components (Lamsal and Faubion, 2009). Poor eating habits, consumption of chlorinated drinking water, stress and certain disease conditions, consumption of alcohol and the use of antibiotics are known to alter the composition and activities of gut flora. These effects are akin to what occurs following systemic antimicrobial treatment on such occasions, the tilt of balance of the bacterial population dynamics results in overgrowth of opportunistic and undesirable bacteria in the gut. The reduction in the proportion of beneficial bacteria leads todevelopment of excessive gas, bloating, constipation, intestinal toxicity and poor absorption of nutrients. Hence, it is essential to enrich the human gut with probiotics in order to maintain the probiotic balance through regular intake of probiotic foods. Many lactobacilli species possess probiotic determinants including resistance to low pH, bile tolerance, adhesive properties, antibacterial activity, and antibiotic susceptibility. There is evidence to suggest that organisms from different origins vary in their probiotic properties (Sandholm *et al.*, 2002).

The possibilities of horizontal gene transfer and recombination to create harmful pathogens in genetically modified (GM) probiotics (Cummins and Wan Ho, 2006) limit the production and application of the GM probiotics. Therefore, many researchers explore novel strains from different sources with improved probiotic potential.

Fermented rice is one of the neglected foods in countries where rice is a staple. Furthermore,despite the numerous strains of probiotic bacteria isolated from different sources including traditional fermented food, there is a paucity of information on fermented rice and their constituent probiotic bacteria. In this backdrop, the objective of the current study was to isolate and identify potentially probiotic microorganisms from fermented rice

4.CONCLUSIONS

Traditional fermented food products such as fermented rice are known to possess probiotic potential. Probiotics are live microorganisms that provide a myriad of health benefits. Despite the associated health benefits, fermented rice has not received due attention in the countries where rice is the staple diet. Many strains of probiotic bacteria have been isolated from different sources, however, not much work has been carried out on isolation of probiotic strains from fermented rice. In this backdrop, the present study was carried out to isolate and identify potentially probiotic microorganisms from fermented rice. Cooked and uncooked white and red rice were separately fermented and subsequently used to isolate potentially probiotic strains. The Man Rogosa Sharpe (MRS), MRS sorbitol (0.2%) and MRS L-cysteine (0.5%) culture media were used for the isolation of potentially probiotic bacteria. The samples of fermented rice were serially diluted, plated and incubated at 37 °C for 2-3 days under anaerobic conditions. The resulting colonies were purified and tested for catalase production and Gram-staining. Distinct cluster like cocci, diplo cocci and rods were observed with gram-positive and catalase-negative reactions. Most of the isolated cluster like cocci morphologically resembled Aercococcus or Peptococcus species. *The rods were selected for motility and endospore test and sugar fermentation was studied using API 50CH kits. The biochemical characteristics (grampositivity and catalase-negativity) non-motile and non-endospore forming and colony and cell morphology of seven rod shaped bacteria resembled the genus Lactobacillus and were identified to species level by API 50CH kits. The subsequent physiological and molecular methods for species identification and probiotic characterization of these seven Lactobacillus spp will further confirm the application of them as potential probiotic starter cultures in the food industry.*