ANTIBACTERIAL ACTIVITY OF AQUEOUS EXTRACTS OF NEEM (AZADIRACHTA INDICA), GARLIC (ALLIUM SATIVUM), GINGER (ZINGIBER OFFICINALE) AND TURMERIC (CURCUMA LONGA) AGAINST GROWTH INHIBITION OF HOSPITAL STRAINS

Student Study Project 2020-21

To

TARA Govt. Degree College& PG (A) College

By
Department of Microbiology
TARA Government Degree& PG (A) College
Sangareddy

TARA GOVERNMENT COLLEGE[A] , SANGAREDDY-502 001

DEPARTMENT OF MICROBIOLOGY
CERTIFICATE

This is to certify that the project work entitled with the "Antibacterial Activity of Aqueous Extracts of Neem (Azadirachta Indica), Garlic (Allium Sativum), Ginger (Zingiber Officinale) And Turmeric (Curcuma Longa) Against Growth Inhibition Of Hospital Strains

"Antibacterial Activity Of Aqueous Extracts Of Neem (Azadirachta Indica), Garlic (Allium Sativum), Ginger (Zingiber Officinale) And Turmeric (Curcuma Longa) Against Growth Inhibition Of Hospital Strains", which has been submitted by B.Sc (Microbiology) Students (2020-2021) to TARA Govt. Degree College is the original work done by them.

The results embodied in this report have not been to any other University or Institution for the award of any degree.

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BONAFIDE CERTIFICATE

Certified that the project report" is the bonafide work of

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DECLARATION

We hereby declare that the project report entitled Antibacterial Activity Of Aqueous Extracts Of Neem (Azadirachta Indica), Garlic (Allium Sativum), Ginger (Zingiber Officinale) And Turmeric (Curcuma Longa) Against Growth Inhibition Of Hospital Strains" , is the work done in the campus at Tara Government College during the academic year 2021.

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TITLE OF THE PROJECT

ANTIBACTERIAL ACTIVITY OF AQUEOUS EXTRACTS OF NEEM (AZADIRACHTA INDICA), GARLIC (ALLIUM SATIVUM), GINGER (ZINGIBER OFFICINALE) AND TURMERIC (CURCUMA LONGA) AGAINST GROWTH INHIBITION OF HOSPITAL STRAINS

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Introduction

Antimicrobials agents are important to reduce infectious diseases. Indiscriminate use of antibiotics resulted in development and spread of multi drug resistant pathogens in developing countries. Misuse of antibiotics is one of the reasons for the increasing rates of resistance, especially in rural areas (27). There is strict need for novel alternative antimicrobial strategies.

In developing countries, Synthetic drugs are not only expensive and inadequate for the treatment of diseases but also often with side effects. The effective treatment of infectious diseases is possible by natural plant extracts with new source of antimicrobial activity and novel mode of action. When compared with conventional antimicrobials natural plant extracts have fewer side effects. Therefore the need for novel alternative antimicrobial strategies has renewed interest in natural products like turmeric, garlic, neem and ginger.

In developing countries like India and backward areas like Mahabubnagar district, Telangana State, people with low income such as farmers, people of small isolated villages and native communities use folk medicine for the treatment of common infectious diseases.

Aims and Objectives

To find out the antimicrobial activity of locally available Neem (*Azadirachta indica*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) and Turmeric (*Curcuma longa*) against growth inhibition of bacterial strains isolated from MNR Medical College.

Review of Literature

As per the classification reports of World Health Organization 15 million people die every year from infectious diseases worldwide and the infectious diseases remain leading cause of death [1]. Antibiotics, the most effective drugs against microbial infections in the 1950s, are recently losing their efficacies as most microorganisms have an acquired resistance [2].

Misuse of antibiotics is one of the reasons for the increasing rates of resistance, especially in rural areas [3]. Therefore, the need for novel alternative antimicrobial strategies has renewed interest in natural products like turmeric, garlic, neem, ginger etc. Exhibiting antibacterial properties.

Plants are the main source of medications for human, since they appear on earth and have abilities to synthesize endless secondary metabolites known as phytochemical compounds which serve as plant defense mechanism against macro and micro-organisms [4]. Compounds derived from plants are being used more and more widely for their potential chemotherapeutic and nutritional value [27, 28].

Most of the recent drugs are initially obtained or semi-synthesized from the plant sources, particularly from those which are prescribed in traditional medicine [5]. Apart from the negative side effects of antibiotics on human organs, the intensive use of antibiotics has led to emerging

of what is called multidrug resistant (MDR) bacteria which are now raising remarkably all over the world and become an international public health threat [6]

Allium. sativum, commonly known as garlic, belongs to the Alliaceae family, which also includes leek, onion and shallot. Garlic is used widely in food and medicine [9, 10, 11], like other herbs and spices [14]. Use of *A. sativum* in alternative medicine has increased over the years [11–15]. Garlic can be prepared in various forms, namely oil, powder, raw juice and extracts [9–20]. The therapeutic effect of garlic has been attributed to its organosulfur constituents, which also are responsible for its typical flavour and odour [9-20]. Other studies have implicated thiosulfinates in the antibiotic activity of garlic [9-20].

Zingeber. officinale is a rhizome commonly known as ginger or gingerroot. It can be consumed as a delicacy,medicine orspice.It lendsits name to its genus and family (Zingiberaceae). Other notable members of this plant family are turmeric, cardamom and galangal [26-27]. Ginger cultivation began in South Asia and then spread to East Africa and the Caribbean. Historically, the traditional medical form of ginger was called Jamaica ginger, which was classified as a stimulant and carminative [26]. Ginger has also frequently been used to disguise the taste of medicines [27]. Studies indicate that ginger may provide short-term relief of pregnancy-related nausea and vomiting [26-27].

Research Methodology

Antibacterial Assay:

1. Bacterial cultures

Test bacterial cultures were obtained from MNR Medical College, Sangareddy**.** Clinical isolates of the bacteria *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureaus* and *Pseudomonas aeruginosa* and *Proteus vulgaris* were used in this study. All the cultures were sub cultured and maintained in nutrient agar slants. Each cultures was inoculated into nutrient broth and incubated for were prepared for each strain.

2. Preparation of Discs

Discs were prepared by cutting Whatman filter paper No. 1 in size of about 6 mm in diameter with the paper puncturing machine. Blank discs were sterilized by dry heat (Hot air oven).

3. Testing antimicrobial activity of extracts against bacterial cultures by Agar Disc Diffusion Method:

Locally available Neem (*Azadirachta indica*) leaves, Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) and Turmeric (*Curcuma longa*) cloves were obtained and sterilized. Aqueous Extracts of each component was prepared by grinding the leaves and cloves in sterile distilled water with mortar and pestle. Sterilized Discs were soaked in the aqueous solution for 24h and air dried.

Each bacterial strain was inoculated into nutrient broth and incubated at 37^0C for 18h in order to reach exponential phase. Each culture broth was swab inoculated on to the nutrient agar plates. Agar surface was allowed to dry for few minutes. Four filter paper discs that were soaked in test solutions were placed on each nutrient agar plate along with standard antibiotic discs susceptible for that particular organism aseptically. The standard antibiotic discs used were supplied by HiMedia. They are Erythromycin for *Staphylococcus aureus*, Tetracycline for *E.coli*, Ciprofloxacin for *Pseudomonas aeruginosa,* Tetracycline for *Klebsiella pneumoniae* , Pencillin for *Proteus vulgaris*.

Plates were incubated at 37^0C for 24 hours, after incubation zone of inhibition of bacterial growth was observed in terms of the diameter of inhibition zone.

Findings/Results

In the present study the aqueous extracts of Neem (*Azadirachta indica*) leaves, Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) and Turmeric (*Curcuma longa*) showed significant antibacterial property against clinical isolate of *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureaus* and *Pseudomonas aeruginosa* and *Proteus vulgaris.*

Turmeric (*Curcuma longa),* Garlic (*Allium sativum*) and Ginger (*Zingiber officinale*) showed zone of inhibition in the range of (1.1) to (1.5) mm inhibited the growth of *Pseudomonas aeruginosa.* The relative percentage of inhibition of growth of *Pseudomonas* against standard antibiotic Ciprofloxacin was slightly high (2.7). Neem (*Azadirachta indica*) has no significant effect on growth inhibition of Pseudomonas.

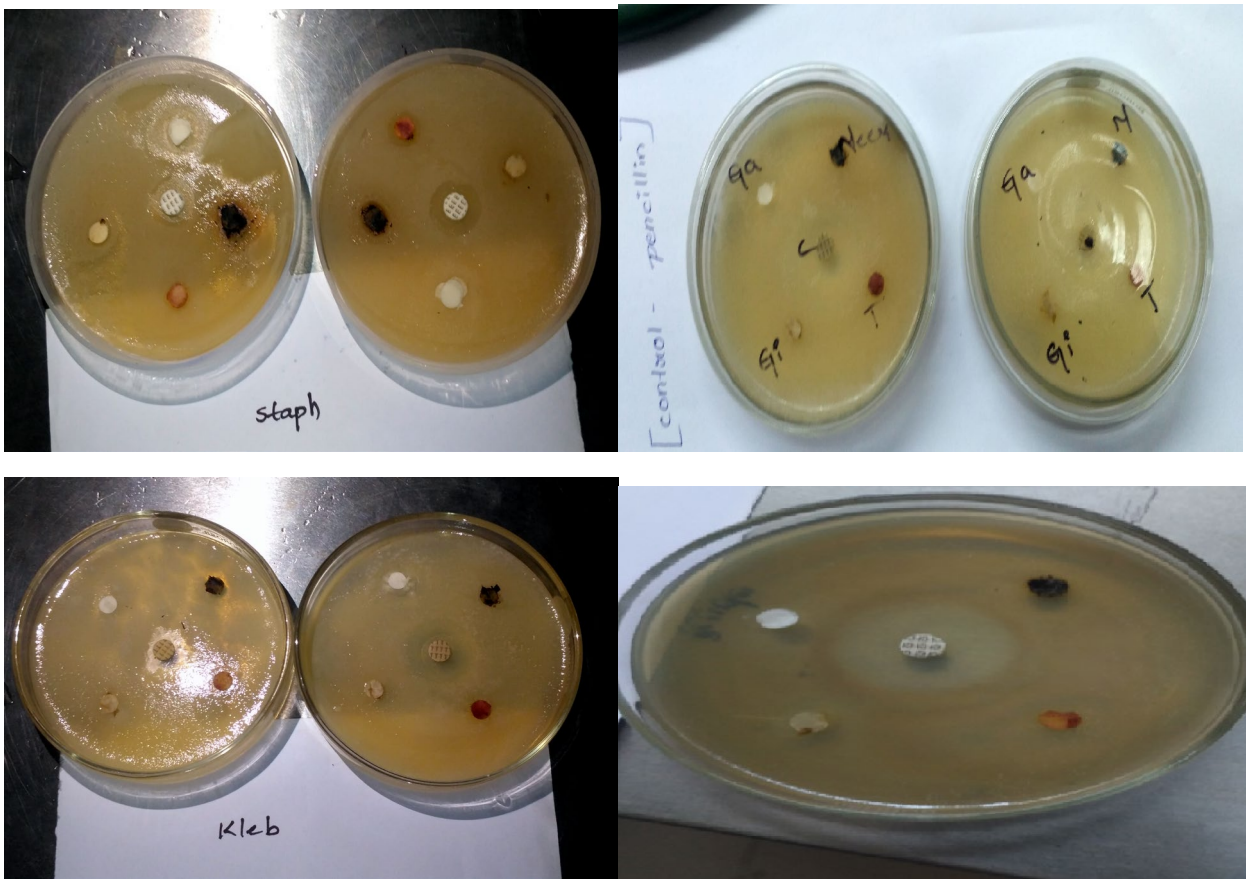
Turmeric (*Curcuma longa),* Garlic (*Allium sativum*) and Ginger (*Zingiber officinale*) showed zone of inhibition in the range of (0.7) to (1.8) mm inhibited the growth of *Klebsiella pneumonia.* The relative percentage of inhibition of growth of *Klebsiella* against standard antibiotic Tetracycline was slightly high (2.0). Neem (*Azadirachta indica*) has no significant effect on growth inhibition of *Klebsiella*.

Neem (*Azadirachta indica*) leaves, Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) showed zone of inhibition in the range of (1.4) to (1.8) mm inhibited the growth of *Escherichia coli*. The relative percentage of inhibition of growth of *E.coli* against standard antibiotic Tetracycline was almost same (1.7) Turmeric (*Curcuma longa)* has less effect on growth inhibition of *E.coli.*

Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) and Neem (*Azadirachta indica*) leaves showed zone of inhibition in the range of (1.0) to (2.0) mm inhibited the growth of *S.aureus*. The relative percentage of inhibition of growth of *S.aureus* by aqueous extract of garlic is higher than the standard antibiotic Erythromycin (1.7).

Turmeric (*Curcuma longa),* Garlic (*Allium sativum*) and Ginger (*Zingiber officinale*), Neem (*Azadirachta indica*) leaves showed zone of inhibition in the range of (0.9) to (1.2) mm inhibited the growth of *P.vulgaris.* The relative percentage of inhibition of growth of *P.vulgaris* by aqueous extract of garlic is higher than the standard antibiotic Penicillin (1.1).

Figure 1.The results are shown in the Table1and Picture 1.**Picture 1. Zone of inhibition of growth of Bacteria against Neem, Garlic, Ginger and turmericExtracts**



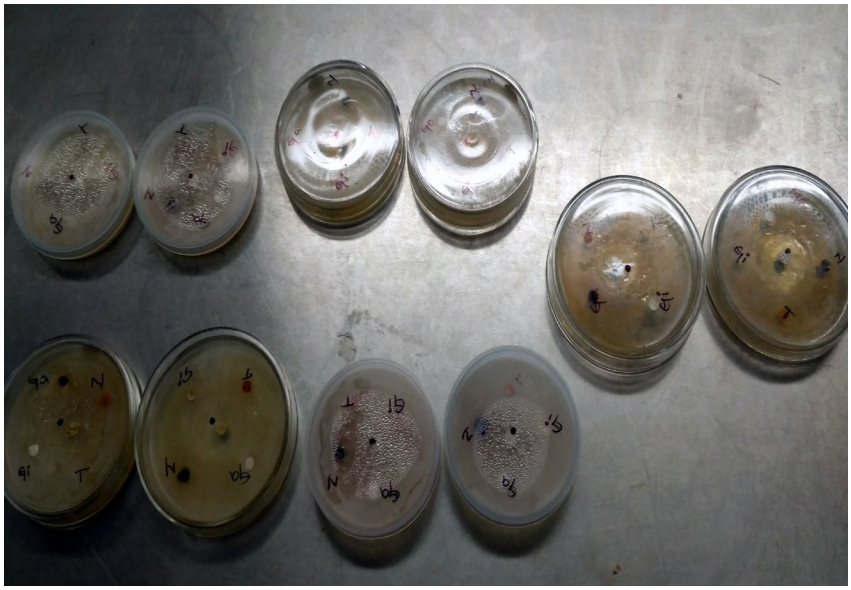


Table.1

Test organism	Aqueous Extract	Diameter of Zone of Inhibition (mm)	
		Original	Duplicate
P. aeruginosa	*Curcuma longa* (Turmeric)	1.3	1.5
	Zingiber officinale (Ginger)	1.1	0.8
	Allium sativum (Garlic)	1.2	0.7
	Azadirachta indica (Neem)	0.6	0.6
	Ciprofloxacin(c)	2.7	2.8
K.pnemoniae	*Curcuma longa* (Turmeric)	0.7	1.9
	Zingiber officinale (Ginger)	1.0	0.8
	Allium sativum (Garlic)	1.3	1.0
	Azadirachta indica (Neem)	0.7	0.7
	Tetracycline (c)	2.0	2.0
E.coli	*Curcuma longa* (Turmeric)	0.9	1.0
	Zingiber officinale (Ginger)	0.9	1.1
	Allium sativum (Garlic)	1.6	0.8
	Azadirachta indica (Neem)	1.4	1.0
	Tetracycline(c)	1.7	2.1
S.aureus	*Curcuma longa* (Turmeric)	0.7	0.8
	Zingiber officinale (Ginger)	0.6	1.0
	Allium sativum (Garlic)	1.7	2.0
	Azadirachta indica (Neem)	1.3	1.0
	Erythromycin (c)	1.3	1.3
P.vulgaris	*Curcuma longa* (Turmeric)	**1.0**	**0.7**
	Zingiber officinale (Ginger)	**0.9**	**0.6**
	Allium sativum (Garlic)	**0.8**	**1.2**
	Azadirachta indica (Neem)	**0.6**	**0.9**
	Penicillin (c)	**1.1**	**1.0**

Conclusions and suggestions

According to present study locally available Neem (*Azadirachta indica*) leaves, Garlic (*Allium sativum*), Ginger (*Zingiber officinale*) and Turmeric (*Curcuma longa*) can be used as substitute source for synthetic antibiotic drugs that are used against *Escherichia coli, Klebsiella pneumonia, Staphylococcus aureaus* and *Pseudomonas aeruginosa* and *Proteus vulgaris* Hospital strains.

Aqueous Extracts of the compounds were selected for testing the antibacterial property in their native form that has been used in day to day life. Natural products are excellent remedy for synthesis of new drugs with fewer side effects.

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