



# REVIEW : ANTIMICROBIAL POTENTIAL OF INDIAN MEDICINAL PLANTS

1.Sakshi Chaudhari,2.Kartik Bhandwalkar,3.Shreyash Tilekar,4. Ajinkya Chougule

Bachelor of Pharmacy

Guide: Professor Biradar S.M

Abstract

As the large portion of the world's population, particularly in developing countries, relies on herbal medicines, research on medicinal plants is critical. Because of the indiscriminate use of commercial synthetic medications for the treatment of infectious diseases in this modern period, multiple drug resistance has arisen against many microbiological infections. Researchers have been obliged to come up with novel ways to combat microbial infections as a result of this situation. The current study examines the antibacterial capabilities of ten medicinal plants, including *Ocimum Tenuiflorum*, *Azadirachta Indica*, *Aloe vera*, *Mimusops Elengi*, *Thymus Vulgaris*, and *Clove*. To determine their antibacterial potential in terms of the zone of bacterial growth inhibition. Water and organic solvents like methanol, chloroform, ethyl acetate, and petroleum ether were used to make leaf and fruit extracts. As a result, the study focuses on the antibacterial potential of five extracts from five plants against seven bacteria, including E. coli, Salmonella, Clostridium difficile Salmonella typhi, Proteus mirabilis, Staphylococcus aureus, Acinetobacter baumannii, Pseudomonas aeruginosa, and Streptococcus pyogenes are among the bacteria that can cause food poisoning. Against both gramme positive and gramme negative bacteria, all of the plant extracts showed considerable antibacterial activity. This study help in the identification of plants with various antibacterial potentials, which could be used to isolate and characterise novel phytochemicals for the treatment of infectious diseases, particularly in light of the emergence of drug-resistant microorganisms and the demand for more effective antimicrobial agents.

**Keywords:**

-Indian	medicinal	plants
-antimicrobial		activity
-bio	active	compounds
-Natural antibiotic		



## Introduction

The review of antimicrobial activity of some medicinal plant used in Ayurveda and traditional medicinal system for treatment of manifestations caused by microorganisms.<sup>[1]</sup> Restorative plants are a vital part of human culture to battle sicknesses, from the beginning of progress. They as a rule contain numerous organically dynamic fixings and are utilized fundamentally for treating gentle or ongoing infirmities. As indicated by World Health Organization (WHO), about 80% of the total populace depends mainly on the plant based customary medication particularly for their essential medical services needs. Natural medications are in incredible interest in the created just as agricultural nations for essential medical care due to their wide organic and therapeutic exercises, higher wellbeing edges and lesser expenses.<sup>[2,3]</sup>

Plants are wealthy in a wide assortment of optional metabolites like tannins, alkaloids, terpenoids and flavonoids having been found in vitro since they have antimicrobial properties and may fill in as another option, successful, modest and safe antimicrobial for the treatment of microbial diseases.<sup>[4]</sup> The utilization of plant concentrates and phytochemicals, both with known antimicrobial properties, can be of incredible importance in remedial medicines. Over the most recent years, various examinations have been directed in various nations to demonstrate such effectiveness. Numerous plants have been utilized as a result of their antimicrobial attributes. Ayurveda is an the important system in the in India. Today the pharmacologically dynamic elements of numerous Ayurvedic prescriptions have been recognized, and their convenience in drug treatment is being resolved. It is generally assessed that of the found 17,000 species, almost 3,000 species are utilized in the therapeutic field.<sup>[5]</sup>

Some time before mankind found the presence of organisms, the possibility that specific plants had healing potential, without a doubt, that they contained what we would right now property as antimicrobial standards, was very much acknowledged.<sup>[6]</sup> Plants with conceivable antimicrobial activity it will be tested again certain microorganisms to confirm the action of these plant. Specialists are progressively directing their concentration toward society medication searching for new better drugs against malignant growth, just as viral and microbial diseases.<sup>[7]</sup>

## Content

### A Review Of Antimicrobial Potential Of Indian Medicinal Plant

#### 1. Tulsi(*Ocimumtenuiflorum*)



Botanicalname-*Ocimum tenuiflorum*

Family- Lamiaceae

Genus - Ocimum

Species-O.tenuiflorum

Commannname-Ocimumsanctum, **Tulsi**, or **HolyBasil**

Tulsi is know as the “Queen of plants” and it is also know as the mother medicine in the nature, due to its perceived medicinal qualities.<sup>[9]</sup>

As of latest researchers worldwide have understood that the powerful life expectancy of any antimicrobial specialist is limited, because of expanding improvement of obstruction by microorganisms. Thus, various examinations have been led to discover new elective wellsprings of antimicrobial specialists, particularly from plants. The points of this venture were to inspect

the antimicrobial properties of fundamental oils refined from Australian-developed *Ocimum tenuiflorum* (Tulsi), to measure the unpredictable parts present in flower spikes, leaves and the fundamental oil, and to research the mixtures liable for any action. Broth micro-dilution was utilized to decide the minimum inhibitory concentration (MIC) of Tulsi fundamental oil against chosen microbial microorganisms. The oils, at concentration of 4.5 and 2.25% totally restrained the development of *Staphylococcus aureus* (counting MRSA) and *Escherichia coli*, while similar focuses just the development of *Pseudomonas aeruginosa*. Of 54 mixtures distinguished in Tulsi leaves, bloom spikes, or fundamental oil, three are proposed to be answerable for this action; camphor, eucalyptol and eugenol. Since *S. aureus* (counting MRSA), *P. aeruginosa* and *E. coli* are significant microbes causing skin and delicate tissue contaminations, Tulsi fundamental oil could be an important effective antimicrobial specialist for the board of skin diseases brought about by these life forms.<sup>[8]</sup>

It has been quite possibly the most esteemed and comprehensive species utilized over years in traditionally medication in India, and every part of plant much all aspects of the plant has been found to have therapeutic properties.<sup>[9]</sup> Traditionally, the Tulsi is utilized in various structures; fluid concentrates from the leaves adried as powder of tulsi are utilized in natural teas or blended in with different spices or honey to enhance the medicinal value of these tea. the traditionally use of Tulsi aq. concentrates in the treatment of various poisoning, stomach-hurt, basic colds, cerebral pains, intestinal sickness, irritation, and coronary illness. 100 Oils extracted from the leaves and inflorescence of Tulsi have been claimed to have numerous useful properties, it will be including as expectorants, analgesics, anti-emetics, and antipyretics, stress reducers and inflammation relievers, and as anti-asthmatic, hypoglycemic, hepatoprotective, hypotensive, hypolipidemic, and immunomodulatory agents.<sup>[9]</sup>

In outline, the fundamental oil separated from *Ocimum tenuiflorum* showed antimicrobial action against *S. aureus* (counting MRSA) and *E. coli*, however was less dynamic against *P. aeruginosa*. Reactions of *P. aeruginosa* to antimicrobial mixtures was as of latest checked.<sup>[11]</sup> In some other studies, *P. aeruginosa* has been shown to be more resistant than other most Gram negative bacteria to the action of the essential oils.<sup>[12]</sup>

## 2. (Neem) *Azadirachta Indica*



Botanicalname-*Azadirachta indica*

Family – Mahogany Meliaceae

Genus - Azadirachta

Species- A.Indica

Commonname -Neem,NimtreeorIndianlilac

Neem is a traditional medicinal plant that is arguably the most beneficial. Every part of the tree has been employed as a traditional medicine for numerous human problems in the home. In India, the tree is still known as the "Village Dispensary." The plant's fruits, seeds, leaves, bark, and roots all contain antiseptic, antiviral, antipyretic, anti-inflammatory, and antiseptic chemicals. Every one of the plants their extract showed impressive antimicrobial movement against chose endodontic microorganisms. At 3mg. focus, O.sanctum was the best against S. mutans, M. elengi showed most high zone of restraint against E.faecalis, though CHX was the bestspecialistagainstS.aureus.CHXwaslikewisethemoststeadyoftherelativemultitudeof medicaments testes, showing inhibitory impact against all the tree microorganisms at all the chose concentration.<sup>[13]</sup>

A significant number of the current manufactured medications are cause a different side effects. Consequently, normal medication plant based mixtures could be valuable in satisfying this need for fresher medications with

negligible results.<sup>[14]</sup> *A. indica* leaves a great antibacterial movement against the extraordinary capability of bioactive mixtures and is useful for rationalizing the use of this plant in primary health care<sup>[15]</sup> Neem is an the ingredient have been traditionally utilized overall particularly in India the role of its dynamic fixings as chemopreventive impacts has been seen in different tumor through regulations of various cell signalling pathway.<sup>[16]</sup> Likewise the antibacterial action of *L. camara* removes shifted with solvents utilized for extraction. Rough readiness of leaves of plant containing both dynamic and non-dynamic parts also have high adequacy than semi unrefined medications or unadulterated plant substances.<sup>[17]</sup>

Numerous author have referenced the secondary metabolites of concentrate effective against bacteria entity were evaluated and recognized as saponins, tannins, heart glycosides, alkaloid, flavonides, steroids, terpenoids<sup>[18]</sup> however, the majority of pharmacological examinations were starter and require serious preclinical and clinical study to assess the adequacy and poisonousness of these plant items.<sup>[19]</sup> The consequences of this test study showed that the viability of effects dependent of concentration used, thus increase in extract concentration leads to increase the inhibition zone. The purpose behind this examination was to assess the impact of leaf extract removes on bacterial strain and was tracked down that, the mix of leaf concentrate of *L. camara* and *A. indica* shows higher zone of inhibition than singular leaf extract. This shows synergistic antibacterial impact on bacterial strain *Escherichia coli*, *P. aureginosa*, *Staphylococcus aureus* and *Bacillus subtilis*.<sup>[20]</sup>

### 3. (Korphad) *Aloevera*-*Aloe barbadensis* miller



Botanical name-*Alo vera*

Family-Asphodelaceae(Liliaceae)

Genus - Aloes

Species- Aloe vera

Common name – Gheekumari, aloe, korphad

Many medicinal plants have been identified as potential sources of new antibacterial chemical compounds, according to aloe vera most prominent of these is , which is widely utilised by a substantial section of the Iranian population to treat burn wound infections. These findings on antibacterial activity are consistent with those of Antonisamy et al., who discovered that DMSO gel extracts of *A. vera* had varying antibacterial and antifungal activity against five bacterial cultures of *Bacillus subtilis*, *Salmonella typhi*, *Escherichia coli*, and *Staphylococcus aureus*, as well as three fungal cultures of *Aspergillus fumigatus*, *Candida albicans*, and *Penicillium* . The results revealed that *A. vera* DMSO gel extracts exhibited the highest level of action against the pathogens tested, with the degree of inhibition varying depending on the extract concentration.

The elements of gel and leaf have been confirmed to be separate by scientific data. Some researchers feel the gel is more active than the leaf, but one thing is certain: the gel and leaf may complement each other in terms of therapeutic properties. Surprisingly, there are conflicting studies on the inhibitory impact of aloe vera gel , leaf, and juice. Anderlet al. demonstrated in 2010 that both gel and leaves suppressed the growth of *S. aureus* isolated from wound infections while the gel has no effect on *P. aeruginosa* isolate.<sup>[21]</sup>

All MDR *P. aeruginosa* strains (except five) were shown to be responsive to *A. vera* gel extract at MIC 400g/mL in our investigation. In addition, despite many published findings to the contrary, the data collected in this investigation demonstrated that *A. vera* gel extract in various concentrations had good antibacterial activity against MDR *P. aeruginosa* isolated from burned patients. The differences in susceptibility testing methods, extraction processes, heat stresses imposed on the gel, and the number of pharmacologically active compounds such as anthraquinones, anthracene, anthranol, aloin, aloe mannan, aloetic acid, aloe emodin, aloeride, chrysophanic acid, resistanol, and the saponin could all be blamed for the contradictory results.<sup>[22,23]</sup>

Research Through Innovation

#### 4. (Bakul)*Mimusopselengi*



Botanicalname-*Mimusopselengi*

Family - Sapotaceae

Geneus-Mimusops

Species-*M.Elengi*

Commname-*Maulsari, bakul, Spanishcherry*

Bakul is a small to huge tree that may be found all throughout India. The plant has a significant role in indigenous medicine, and its many parts are utilised to cure a variety of systemic ailments, including dental issues. It has anti-inflammatory, anti-analgesic, antibacterial and antipyretic properties. The bitter, astringent bark of *M. elengi* is used as a gargle for a variety of ailments. A dosage of 3 mg, Bakul was the most efficient drug against *E. faecalis*. The difference with other drugs, on the other hand, was statistically insignificant ( $P < 0.05$ ). The antibacterial benefits of this plant extract against dental infections have been studied.

The extract was proven to be efficient against Streptococci isolated from dental patients' tooth tartar, validating a long-held belief. The extract is efficient at even lower concentrations, with a MIC value of 250 g, according to our research. This could be related to the solvent used in extract extraction. Methanolic extracts may have more action than other extracts because more phytoconstituents are leached in them. In the methane industry, several

glycosides, alkaloids, phenols, tannins, and the saponins have been screened.<sup>[13]</sup> The leaves, bark, fruit, and seeds of *Mimusops elengi* have astringent and tonic qualities in dental diseases and uterine illnesses. Analgesic, diuretic, antiulcer, and anti-inflammatory properties have also been documented for this herb. antipyretic, and antibacterial properties.

When it will be compared to other antioxidants, *M. elengi* leaf extracts demonstrated high antioxidant activity in several solvents such as nhexane, dichloromethane, and methanol . Kalaiselvi et al. evaluated the antioxidant characteristics of *M. elengi* using both enzymatic and non-enzymatic antioxidant activities. The antibacterial action of silver nanoparticles is well recognised, as is the biogenic potential of silver nanoparticles. Fruit (pericarp) and flower extracts from *M. elengi* have been found to be effective antimicrobials against both gram-positive and gram-negative bacteria. As a result, the ethanolic extracts of *M. elengi* leaf, seed, and bark were examined phytochemically and tested their are against six different bacterial strains in the current investigation to determine the potentiality of the antibacterial activity.<sup>[24]</sup>

*M. elengi* extracts demonstrated antibacterial action against *Streptococcus mutans*, a dental caries-causing bacteria isolated from patients. *M. elengi* bark extracts in he acetone, petroleum ether, methanol, and water were investigated for antibacterial efficacy against bacteria that cause tooth infections.

According to Hazra et al., *M. elengi* seed extracts produced with petroleum ether, ethyl acetate, and ethanol demonstrated antibacterial efficacy against *E. coli*, *B. subtilis*, and *S. enterica* serovar Typhi.<sup>[24]</sup>

##### 5. (Jangliajwain) *Thymus vulgaris*



Botanicalname-*Thymusvulgaris*

Family-Mints

Geneus-Thymes

Species-T.vulgaris

Commname-Thyme,GardenThyme,Ajwain

*Thymus vulgaris* L. (thyme), also known as "zaatar" or "zaitra," is a Lamiaceae member with expectorant, antitussive, antibronchitic, antispasmodic, anthelmintic, carminative, and diuretic effects.

*Thymus* genus has become one of the most popular plants all over the world due to its fragrant and therapeutic characteristics. *Thymus* species are utilised as herbal teas, flavouring agents (condiment and spice), and medicinal plants. The principal volatile compounds derived from the aerial sections of the plant are geraniol and linalool, according to the published results.

Plant essential oils and extracts have been utilised in food preservation, medicines, alternative medicine, and natural remedies for thousands of years. It has long been known that several plant essential oils have antibacterial qualities, and it is now widely accepted. It is vital to do scientific research on certain plants. have long been used in traditional medicine to help people feel better. Healthcare of high grade. To increase the quality of healthcare, it is vital to do scientific research on plants that have been utilised in traditional medicine. Essential oils may contain unique antibacterial chemicals that are effective against bacterial infections.

*Thymus* species exhibit powerful antibacterial, antifungal, antiviral, antiparasitic, spasmolytic, and antioxidant properties, according to recent research.

The antibacterial activity of thyme essential oil was discovered.<sup>[25]</sup>

The essential oil of *Thymus vulgaris* exhibits antibacterial properties against the most common oral infections. In 2017, Fani M et al. conducted a study on the antibacterial properties of *Thymus vulgaris* oil. The hydro-distillation method is used to make *thymus vulgaris* oil. *Thymus vulgaris* oil, at concentrations ranging from 16 to 256 mg/mL, showed substantial inhibitory action. *Streptococcus pyogenes* and *Streptococcus pyogenes* are two strains of *Streptococcus pyogenes*. The most subtle isolates were *Streptococcus mutans* and *Streptococcus mutans*, with MICs of 1.9 and 3.6 mg/mL, respectively. The MIC values for *Candida albicans*, *A. actinomycetemcomitans*, and *Porphyromonas gingivalis* were 16.3, 32, and 32 mg/mL, respectively. Manconi M et al. formulated *Thymus capitatus* essential oil in 2018. *Lactobacillus acidophilus*, for example, has been shown to be inhibited by the oil.

*Streptococcus mutans*, a cariogenic bacteria, and *Streptococcus sanguinis*, a commensal bacteria. Oral cavity problems can be treated with a mixture of both oils.<sup>[26]</sup>

## 6. (lavang)clove



Botanical name – *Syzygium aromaticum*

Family – Myrtaceae Genus – *Syzygium*

Species – *S. aromaticum*

Common name – Lavang, clove

Essential oils may contain unique antibacterial chemicals that are effective against bacterial infections. Essential oils from plants have antibacterial properties that have been utilised practically for millennia, but they have only lately been examined scientifically. A growing amount of research on the antibacterial activity of diverse plant oil extracts and their specific components is being assembled for future application in domains ranging from food to dentistry. Clove oil possesses biological qualities such as antibacterial, antifungal, insecticidal, and antioxidant capabilities, and has been used in cuisine for centuries as a flavouring ingredient and antimicrobial material.

Clove oil is also used as an antiseptic in the treatment of oral infections. Mold, yeast, and bacteria have all been claimed to be inhibited by this essential oil. In a tripton soy broth and cheese, it was effective against *L. monocytogenes* and *S. Enteritidis*. Clove essential oil's significant biological and antibacterial properties are due to the high amounts of eugenol it contains. Both eugenol and clove essential oil phenolic components have been shown to denature proteins and react with cell membrane phospholipids, altering

their permeability and inhibiting a wide range of Gram-negative and Gram-positive bacteria, as well as several yeast strains. [27]

## 7. (lahasun)Garlic



Botanical name- *Allium sativum*

Family- Amaryllidaceae

Genus- Allium

Species- *A. sativum*

Common name- Lehsan, garlic

Because of its medical characteristics, *Allium sativum* L. var. *aggregatum* has been used as a medicinal herb in India since the Vedic time. Garlic does not grow wild; “sativum” means “cultivated,” and it appears to have originated in Central Asia's hilly highlands. Garlic has been grown for more than 5000 years. Garlic was already widely used, according to various representations in Mesopotamian writings from 3000 B.C. and Egyptian art from 2700 B.C. Garlic is recommended by Hippocrates, Galen, Pliny the Elder, and Dioscorides for parasites, respiratory issues, poor digestion, and low energy. These chemicals have been shown to have antibacterial and antifungal properties. Garlic's allicin fights fungus and parasites, decreases

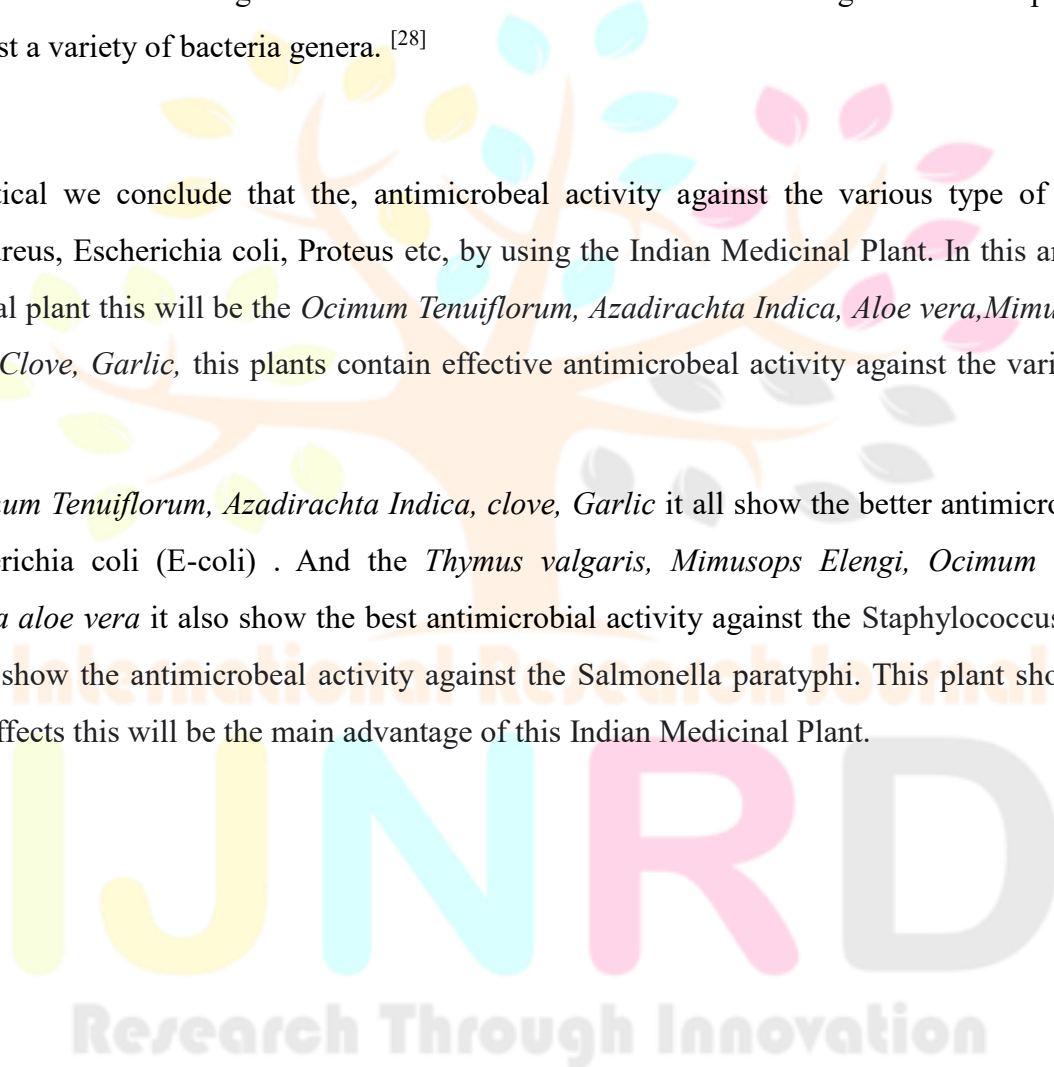
blood cholesterol, cures artero sclerosis, and improves circulatory function. Insect stings are treated with garlic preparations, and scar healing is improved. According to epidemiological studies, garlic ingestion reduces the incidence of many malignancies.

Garlic bulbs have fleshy parts (cloves) that are separated by a papery skin (tunic). The plants have a leafless flower stem (scape), but the blooms are sterile and produce bulbils (little cloves) instead of seeds; the species is replicated clonally from bulbils and cloves. Garlic extracts have long been known to have antibacterial action throughout a broad spectrum. They have antibacterial activity against numerous bacteria genera (Staphylococcus, Vibrio spp.). Garlic extracts have long been known to have antibacterial action throughout a broad spectrum. They are effective against a variety of bacteria genera. [28]

## Conclusion

In this review article we conclude that the antimicrobial activity against the various types of bacteria eg. Staphylococcus aureus, Escherichia coli, Proteus etc, by using the Indian Medicinal Plant. In this article we use the seven medicinal plants which will be the *Ocimum Tenuiflorum*, *Azadirachta Indica*, *Aloe vera*, *Mimusops Elengi*, *Thymus Vulgaris*, *Clove*, *Garlic*, these plants contain effective antimicrobial activity against the various types of bacteria.

In which the *Ocimum Tenuiflorum*, *Azadirachta Indica*, *clove*, *Garlic* all show the better antimicrobial activity against the Escherichia coli (E-coli). And the *Thymus vulgaris*, *Mimusops Elengi*, *Ocimum Tenuiflorum*, *Azadirachta Indica*, *aloe vera* also show the best antimicrobial activity against the Staphylococcus aureus. And the *Aloevera* also shows the antimicrobial activity against the Salmonella paratyphi. This plant shows the result without any side effects; this will be the main advantage of this Indian Medicinal Plant.



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