

**Review Article**

**INDIAN MEDICINAL PLANTS AS AN EFFECTIVE ANTIMICROBIAL AGENT**

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**ABSTRACT**

India is a great country that is recognized for its rich culture and medicinal plants. Most of the people in India are reliant on the herbal plants for their therapeutic needs. The present review will focus on Therapeutic plants from India along with its medicinal use.

Various medicinal plants have already proved their significance with curing diseases including bacteriological infections and some life threatening serious diseases. Medicinal plants are rich in antioxidant and proved best as antimicrobial agents. Herbal drugs are achieving popularity as compared to allopathic drugs the reasons includes adverse effects of man-made antibiotics, the prompt surge in contagious diseases, the resistance of drug in microbes. Herbal plants show slow recovery; still a great population is using it because it showed no side effects and low resistance in microbes. Antimicrobial status of various herbal plants has been reported. Therapeutic plants work as a potent antimicrobial. Herbal plants are used for its medicinal purpose throughout the world as herbal plant provides a base material for various effective drugs. A great number of herbal plants has been used as a drug in the form of crude extracts and extensively used for their therapeutic possessions. A huge number of plants have been examined for antimicrobial possessions, but still the majority of plants have not been examined adequately. So, the present review will focus on some of the selected medicinal plants along with its antimicrobial status.

**Keywords:** Medicinal plants, Antimicrobial agent, Infections, Herbal drugs, Antifungal

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**INTRODUCTION**

The medical plants were in use since ages, Indian subcontinent uses plants for curing diseases, and the stream of science which deals with plants and its therapeutic effects were governed by Ayurveda. Ayurveda remains an important system of medicine and drug therapy in India. Today the pharmacologically active ingredients of many Ayurvedic medicines have been identified, and their usefulness in drug therapy is being determined. It is roughly estimated that of the discovered 17,000 species, nearly 3,000 species are used in the medicinal field.

As believed that Ayurveda exists in India for thousands of years. It employs various techniques to cure diseases. Ayurveda is totally dependent on herbal plants and its derivatives. According to World Health Organization, medicinal plants are the best source to obtain newer herbal drugs. About 80% of individuals from developed countries use traditional medicine, which has compounds derived from medicinal plants. Therefore, such plants should be investigated for a better understanding of their properties, safety, and efficacy.

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency. Many plants have been used because of their antimicrobial traits.

In the present review we have tried to include some of the antibacterial and antifungal effects of medicinal plants, the methanol leaf extracts of *Tinospora cordifolia*, *Ziziphus mauritiana*, *Sida cordifolia*, *Acacia nilotica*, *Withania somnifer* have showed potent antibacterial activity against *Bacillus subtilis*, *E. coli*, *Pseudomonas fluorescens*, *Staphalococcus aureus* and *Xanthomonas axonopodis* and antifungal activity against *Aspergillus flavus*, *Dreschlera turcica*, and *Fusarium verticillioides*. *Withania somnifer* is recognized as strong antibacterial, Methanol extract of *Withania somnifer* is effective against *Candida albicans* [1]. Organic extracts of *Cassia fistula* and *Acacia aroma* shows potent antibacterial and antifungal activities against various gram-positive bacteria.

*Azadirachta indica* popularly known as neem is effective against various infections and diseases, Neem shows antibacterial activity

strongly against *Vibrio cholera* [2] Essential oil and organic extracts of *Ziziphora clinopodioides* shows antibacterial activity against a huge class of bacteria including *Acidovorax facilis*, *Bacillus flexus*, *Bacillus sphaericus*, *Brevibacillus brevis*, *Corynebacterium*, *ammonia genes*, *Enterobacter sakazakii*, *Moraxella catarrhalis* and *Xanthomonas* [3]. *Argemone mexicana* is reported to reduce bacterial infections of *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* when used as a crude extract with chloroform [4]. As reported *Nephelium lappaceum* methanolic extracts is effective against *streptococcus epidermidis* [5]. *Punica granatum* is used as an effective agent against various antibacterial, anti-inflammatory and anti-allergic reactions against *Streptococcus aureus* and *Streptococcus epidermidis* [6].

In Asia, people use plant extract of *Ruta graveolens* and *Zingiber officinale*, and it inhibits the growth of *Bacillus cereus* species [7]. Oil extracted from *Achillea millefolium*'s leaves and stem represent higher antimicrobial activity compared to its organic extracts. Essential oil from the plant inhibits the growth of *Streptococcus pneumonia*, *Clostridium perfringes* and *Candida albicans* and it inhibits *Mycobacterium smegmatis*, *Acinetobacter lwoffii* and *Candida krusei* [8].

70% methanol extract from leaves of *Mikania glomerata* ("guaco"), mguava, *Baccharis trimera* (carqueja), *Mentha piperita* (peppermint) and *Cymbopogon citratus* (lemongrass), and *A. sativum* (garlic), *Syzygium aromaticum* (clove) and *Zingiber officinale* (ginger) worked as an antimicrobial, all showed action against *Staphylococcus aureus* and satisfactory result in clove at the concentration of 0.36 mg/ml and guava at 0.56 mg/ml. According to a study the hydroalcoholic extracts from *Vernonia polyanthes* ("assa-peixe"), *Aristolochia triangularis* ("cipó mil-homens"), *Tabebuia avellaneda* (purple trumpet tree) and *Stryphnodendron adstringens* ("barbatimão") shows antimycobacterial activity [9].

*Vernonia Polyanthes* extract shows potent inhibitory activity against Leishmania strains. In the same way, under same condition *Baccharis dracunculifolia* oil ("alecrim-do-campo") at a concentration of 10-µL inhibits the microbial growth of *E. coli*, *Staphylococcus aureus* and *P. aeruginosa* [10]. Alkaloid extract of *Phyllanthus discoideus* inhibits the growth of many pathogenic bacteria including *E. coli*, *E. faecium*, *P. aeruginosa*, *S. aureus* and *M. smegmatis* [11].

Leaves of some medicinal plants including *Achyranthes aspera*, *Artemisia parviflora*, *Azadirachta indica*, *Calotropis gigantean*, *Lawsonia inermis*, *Mimosa pudica*, *Ixora coccinea*, *Parthenium hysterophorus* and *Chromolaena odorata* were examined for antimicrobial activity against various bacteria in different solvents, and they show their maximum inhibition against *E. coli*, *S. aureus*, *X. vesicatoria*. Chloroform extract of *Curcuma amada* was effective against *Bacillus cereus* and *Bacillus subtilis* bacteria [12], a novel product named amadan numen from *curcuma amada* inhibits the bacterial growth. Crude methanolic extract of *Mallotus peltatus* is reported to be effective against the bacterial growth of *Staphylococcus*, *Streptococcus*, *Bacillus* species [13].

*Emblica officinalis* and *Nymphae odorata* extract together is used to suppress the bacterial growth of *Staphylococcus aureus*. *Gallium Sativum* [14], commonly known as garlic is useful against various disease; it is rich in anti-oxidant. *Eucalyptus Globulus* is also known as eucalyptus is used to treat disorders of the urinary and respiratory tract, it shows a high level of antibacterial and anti-fungal properties.

*Bidens pilosa* L extract is used as anthelmintic and protozoaicide agent, used for its antiseptic properties [15]. It is rich in flavonoid [16], The ethanol leaf extract of *Bixa orellana* L shows antimicrobial activity against gram-positive bacteria [17] *Candida albicans* is also used against malaria and leishmaniasis [18], Its seed contain carotenoids [19]. The ethanol leaf extract of *Cecropia peltata* L was effective as anti-bilious, cardiotoxic and diuretic agent [20] and leaves are valuable as medicine against leishmaniasis and warts [21, 22].

Decoction of Leaves from *Cinchona officinalis* is found effective against amebiasis. Dried bark is used to treat diseases caused by a pathogenic strain of *P. falciparum*, and herpes [23]. This extract is a rich source of quinoline alkaloid [24]. Medicinal plant *Gliricidia sepium* is rich in antioxidant, Its branches and leaves are effective against fever, employed against infections caused by *Microsporium canis*, *Trichophyton menta* agrophytes, and *Neisseria gonorrhoea* [25]. Aqueous extract of *Jacaranda mimosifolia* is effective against *Pseudomonas aeruginosa*; the flowers of the plant contain flavones and flavonoids [27]. The leaves of the plants are known to have triterpenes, flavones, and steroids [26].

*Justicia secunda* is used as a disinfectant to treat scorpion wounds [27] while *Piper pulchrum* is found effective against snake bite [28]. Flowers from medicinal plant *Spilanthes Americana* is effective against infections of mouth and variety of herpes; they possess spilantol [29].

Carbazole alkaloid extracted from the stem bark of *clausena anisata* contains antibacterial and antifungal properties [30]. Alcoholic and acetonic leaf extract of *Cassia alata* is reported with antibacterial activity against *Staphylococcus aureus*, coagulase positive *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus stearothermophilus*, *Escherichia coli*, *Salmonella typhi* and *Salmonella dysmetriae* while the alcoholic leaf extract of the same inhibits the growth of *Klebsiella pneumonia* and acetone extract inhibits the growth of *Vibrio cholerae* [31].

Dry nuts of *semecarpus anacardium* is effective against various bacteria including 3- gram negative bacteria (*Escherichia coli*, *Salmonella typhi* and *proteus vulgaris* and gram positive strain (*Staphylococcus aureus* and *Corynebacterium diphtheriae*) [32]. Medicinal plant *amona glabra* shows potent antibacterial, antifungal modest insecticidal, sporicidal and cytotoxic activity. The hexane extract of the plant is used for the procedure [33].

Antibacterial activity of plants like *Eugenia caryophyllus*, *Thymus vulgaris*, *Cinnamomum zeylanium* and *Cuminum cyminum*, hexane extract of these plants were examined on various gram negative and gram positive bacteria, and *Thymus vulgaris* shows best antibacterial activity among all [34].

*Cuminum Cuminum* popularly known as cumin reported showing high antibacterial and antifungal properties. Extracts from the bark of Walnut are effective against *pseudomonas* and *candida* microorganisms; it is active against all microbial infections. *Thymus Vulgaris* used against the antibacterial activity because it is rich in phenol, *Achillea Millefolium* reported to show effectiveness in healing properties against antibacterial and antifungal infections,

commonly it is used to cure wound, it is used as an extract in an organic solvent. *Pinus Silvestris* commonly known as pine used widely for its antiseptic activities, because of the presence of turpentine it is widely used against urinary tract infections and can be used against fungal infections. Organic extract from *Peumus boldus*, *Agathosma betulina*, *Echinacea angustifolia*, *Humulus lupulus*, *Glycyrrhiza glabra*, *Mahonia aquifolium*, *Usnea barbata* and *Anemopsis californica* shown activity against various microbial and fungal infections.

## DISCUSSION

The above-mentioned review clearly shows that medicinal plants are an important link between diseases and drugs; they play an active role in curing all disease and infections. Almost all plants have medicinal belongings; the main aim of the article was to consider few therapeutic plants of Indian origin.

## CONFLICT OF INTERESTS

Declared none

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