



Panacea Journal of
Pharmacy and
Pharmaceutical
Sciences
ISSN: 2349 7025

Review Article

Volume 6 Issue 1

INDIAN MEDICINAL PLANTS AS AN EFFECTIVE ANTIMICROBIAL AGENT

Richa Tyagi *¹, Gaurav Sharma ¹, Nakuleshwar Dut Jasuja¹, Ekta Menghani²

¹Department of Biotechnology, School of Life Sciences, Suresh Gyan Vihar University, Jaipur, India

²Department of Biotechnology, JECRC University, Jaipur, India

Article history:

Received: 8th April 2017

Received in revised form:
17th April 2017

Accepted: 17th April 2017

Available online:
30th May 2017

*Corresponding author:

Richa Tyagi *

E-mail: richatyagi31@gmail.com

Present address:

Department of Biotechnology,
School of Life Sciences, Suresh
GyanVihar University, Jaipur,
India

These authors have no
conflict of interest to declare.

Copyright © 2012,

All rights reserved

Abstract:

India is a great country that is recognised for its rich culture and medicinal plants. Most of the people in India is reliant on herbal plant 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, prompt surge in contagious diseases, resistance of drug in microbes. Herbal plants shows 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 plants provide base material for various effective drugs. A great number of herbal plants has been used as drug in the form of crude extracts and extensively used for their therapeutic possessions. Huge number of plants has been examined for antimicrobial possessions, but still majority of plants have not been examined adequately.

So, the present review will focus on some of the selected medicinal plant along with its antimicrobial status.

Key words: Medicinal plants, antimicrobial agent, infections, herbal drugs, antifungal.

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 medicinal field.

As believed that Ayurveda exists in India since 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 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 *Tinosporacordifolia*, *Ziziphusmauritiana*, *Sidacordifolia*, *Acacia nilotica*, *Withaniasomnifer* have showed potent antibacterial activity against *Bacillus subtilis*, *E. coli*, *Pseudomonas fluorescens*, *Staphalococcus aureus* and *Xanthomonas axonopodis* and antifungal activity against *Aspergillus flavus*, *Dreschleraturcica* and *Fusarium verticillioides*. *Withaniasomniferis* recognized as strong antibacterial, Methanol extract of *Withania somnifer* is effective against *Candidaalbicans*[1]. Organic extracts of *Cassia fistula* and *Acacia aroma* shows potent antibacterial and antifungal activities against various gram positive bacteria.

Azadirachtaindica 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 *Ziziphoraclino podioides* shows antibacterial activity against a

huge class of bacteria including *Acidovoraxfacilis*, *Bacillusflexus*, *Bacillusphaericus*, *Brevibacillusbrevis*, *Corynebacterium ammoniagenes*, *Enterobacter sakazakii*, *Moraxella catarrhalis* and *Xanthomonas*[3]. *Argemonemexicanais* reported to reduces bacterial infections of *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* when used as crude extract with chloroform,[4]. As reported *Nepheliumpulpaceum* methanolic extracts is effective against *streptococcus epidermidis*[5]. *Punicagranatum* 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 *Rutagraveolens* and *Zingiberofficinale* and it inhibits the growth of *Bacillus cereus* species [7]. Oil extracted from *Achilleamillefolium*'s leaves and stem represents 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 inhibit *Mycobacterium smegmatis*, *Acinetobacter lwoffii* and *Candida krusei*[8]

70% methanol extract from leaves of *Mikaniaglomerata* ("guaco"), guava, *Baccharis trimera* (carqueja), *Menthapiperita* (peppermint) and *Cymbopogon citratus* (lemongrass), and *A. sativum* (garlic), *Syzygium aromaticum* (clove) and *Zingiberofficinale* (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 *Vernoniapolyanthes* ("assa-peixe"), *Aristolochiatriangularis* ("cipó mil-homens"), *Tabebuia avellanedae* (purple trumpet tree) and *Stryphnodendron adstringens* ("barbatimão") shows anti mycobacterial 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 gigantea*, *Lawsonia inermis*, *Mimosa pudica*,

Ixoracoccinea, *Partheniumhysterophorus* and *Chromolaenaodorata* 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 amadannulen from *curcuma amada* inhibits the bacterial growth. Crude methanolic extract of *Mallotuspeltatus* is reported to be effective against the bacterial growth of *Staphylococcus*, *Streptococcus*, *Bacillus* species. [13]

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

*Bidenspilosa*L extract is used as antihelmintic and protozoaide agent, used for its antiseptic properties[15] ,It is rich in flavonoid[16],The ethanol leaf extract of *Bixaorellana*L shows antimicrobial activity against gram positive bacteria[17] *Candida albicansis* also used against malaria and leishmaniasis [18], Its seed contain carotenoids [19].The ethanol leaf extract of *Cecropiapeltata*L was effective as anti-bilious, cardio tonic and diuretic agent [20] and leaves are valuable as medicine against lenorrhoea and warts[21][22]

Decoction of Leafs from *Cinchona officinalis* is found effective againstamebiasis. Dried bark is used to treat diseases caused by pathogenic strain of *P. falciparum*, and herpes [23].This extract is a rich source of quinoline alkaloid [24].Medicinal plant *Gliricidiasepiumis* rich in antioxidant, Its branches and leafs are effective against fever ,employed against infections caused by *Microsporumcanis*, *Trichophyton mentagrophytes*, and *Neisseria gonorrhoeae* [25. Aqueous extract of *Jacaranda mimosifoliais* effective against *Pseudomonas aeruginosa*, the flowersof the plant contain flavones and flavonoids [27].The leafs of the plants are known to have triterpenes, flavones, and steroids [26]

Justiciasecundais used as a disinfectant to treat scorpion wounds [27] while *Piper pulchrumis* 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 stem bark of *clausenaanisata* contain antibacterial and antifungal properties [30]. Alcoholic and acetic 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 dysenteriae* 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 *semecarpusanacardium* is effective against various bacteria including 3 gram negative bacteria (*Escherichia coli*, *Salmonella typhi* and *proteusvulgeris* and gram positive strain (*Staphylococcus aureus* and *Corynebacterium diphtheriae*) [32]. Medicinal plant *amomumglabrum* show potent antibacterial, antifungal, insecticidal, sporicidal and cytotoxic activity. Hexane extract of the plant is used for the procedure. [33]

Antibacterial activity of plants like *Eugenia caryophyllus*, *Thymus vulgaris*, *Cinnamomumzeylanicum* and *Cuminumcyminum*, 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]

CuminumCuminum popularly known as cumin reported to show 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 antibacterial activity, because it is rich in phenol, *AchilleaMillefolium* 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 organic solvent. *PinusSilvestris* 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 *Peumusboldus*, *Agathosmabetulina*, *Echinacea angustifolia*, *Humuluslupulus*, *Glycyrrhizaglabra*, *Mahoniaaquifolium*, *Usneabarbata* and *Anemopsiscalifornica* show activity against various microbial and fungal infections.

Discussion:

The above mentioned review clearly shows that medicinal plants are important link between diseases and drugs, they play 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.

References

1. Kambizi, L. and A.J. Afolayan. Extracts from *Aloe ferox* and *Withaniasomnifera* inhibit *Candida albicans* and *Neisseria gonorrhoea*. African J. Biotechnol.(2008). 7: 12-15.
2. Thakurta P, Bhowmik P, Mukherjee S, Hajra T K, Patra A, Bag PK. Antibacterial, antisecretory and antihemorrhagic activity of *Azadirachta indica* used to treat cholera and diarrhea in India. J Ethnopharmacol.(2007).111(3):607-612
3. Ozturk S, Ercisli S. Chemical constitutions and antibacterial activity of *Ziziphora clinopodioides*. Food Control.(2007). 18 (5):535-540
4. Bhattacharjee I, Chatterjee S K, Chandra G. Isolation and identification of antibacterial components in seed extracts of *Argemone Mexicana* L. (Papaveraceae). Asian Pac J Trop Med.(2010). 3(7):547-551.
5. Thitilertdech N, Teerawutgulrag A, Rakariyatham N. Antioxidant and antibacterial activities of *Nephelium lappaceum* L. extracts. LWT - Food Sci Technol.(2008) 41(10): 2029-2035
6. Panichayupakaranant P, Tewtrakul S, Yuenyongsawad S. Antibacterial, anti-inflammatory and anti-allergic activities of standardized pomegranate rind extract. Food Chem.(2010).123 (2): 400-403.
7. Alzoreky NS, Nakahara K. Antibacterial activity of extracts from some edible plants commonly consumed in Asia. Int J Food Microbiol.(2003),80(3):223-30.
8. Candan F, Unlu M, Tepe B, Daferera D, Polissiou M, Sokmen A. Antioxidant and antimicrobial activity of the essential oil and methanol extracts of *Achillea millefolium* subsp. *Millefolium* Afan. (Asteraceae). J Ethnopharmacol.(2003).87(2-3):215-20
9. Oliveira DG, Prince KA, Higuchi CT, Santos ACB, Lopes LMX, Simões MJS. Anti-mycobacterial activity of some Brazilian indigenous medicinal drinks. J Basic Appl Pharm Sci.(2007).28(2):165-9
10. Braga FG, Bouzada ML, Fabri RL, Matos MO, Moreira FO, Scio E. Anti-leishmanial and antifungal activity of plants used in traditional medicine in Brazil. J Ethnopharmacol. (2007).111(2):396-402

11. Mensah J L, Lagarde I, Ceschin C, Michelb G, Gleye J, Fouraste I. Antibacterial activity of the leaves of *Phyllanthusdiscoideus*. *J Ethnopharmacol.* (1990).28(1): 129-133.
12. K Policegoudra R S, Abiraj K, Gowda D C, Aradhya S M. Isolation and characterization of antioxidant and antibacterial compound from mango ginger (*Curcuma amada* Roxb.) rhizome. *J Chromatogr B.*(2007). 852 (1-2): 40-48.
13. Chattopadhyay D, Arunachalam G, Mandal A B, Sur T K, Mandal S C, Bhattacharya S K. Antimicrobial and anti-inflammatory activity of folklore: *Mallotuspeltatus* leaf extract. *J Ethnopharmacol.*(2002). 82(2-3):229-237.
14. Mandal S, Mandal M D, Pal N K, Saha. Synergistic anti-*Staphylococcus aureus* activity of amoxicillin in combination with *Emblica officinalis* and *Nymphaeodorata* extracts. *Asian Pac J Trop Med.*(2010). 3(9):711-714
15. Bondarenko AS, Petrenko GT, Aizenman BE, Evseenko OV. Anti-microbial properties of phenylheptatriyne, a polyacetylene antibiotic. *Mikrobiologicheskii Zhurnal.*(1985).47:81-83.
16. Brandao MGL, Krettli AU, Soares LSR, Nery CGC, Marinuzzi HC. Antimalarial activity of extracts and fractions from *Bidens pilosa* and *Bidens* species (Asteraceae) correlated with the presence of acetylene and flavonoid compounds. *J Ethnopharmacol.* (1997).57:131-138
17. Fleischer TC, Ameade EPK, Mensah MLK, Sawyer IK. Antimicrobial activity of the leaves and seeds of *Bixa orellana*. *Fitoterapia.* (2003).74:136-38.
18. Irobi ON, Moo-Young M, Anderson WA. *In vitro* clonal propagation of annatto (*Bixa orellana* L.) *Pharm Biol.*(1996).34:87.
19. Kiokias S and Gordon MH. Antioxidant properties of annatto carotenoids. *Food Chem.* (2003),83:523-529
20. Caceres A, Lopez BR, Giron MA, Logemann H. Plants used in Guatemala for the treatment of dermatophytic infections. 1. Screening for antimycotic activity of 44 plant extracts. *J Ethnopharmacol.*(1991),31:263-409.
21. Hikawczuk J, Saad V, Guardia T, Juarez AO, Giordano OS. Anti-inflammatory activity of compounds isolated from *Cecropia pachystachya*. *Anales de la Asociacion Quimica Argentina.*(1998),86:167-170
22. Vásquez ML. Plantas y frutas medicinales de Colombia y América. Bogotá: Climent. *Cecropia*,(1982), pp. 134-135.
23. Warhurst DC. Cinchona alkaloids and malaria. *Lancet.*(1981).2:1346-1347

24. Wijesekera OB, Rajapakse LS, Chelvarajan DW. A simple thin-layer chromatographic method for separation of cinchona alkaloids. *J Chromatogr.*(1976).21:388-389
25. Gupta MP. *Plantas Medicinal esIbero americanas*. Bogota: Presencia Ltd; Gliricidiasepium. (1995).pp. 378-379.
26. Gambaro V, Garbarino JA, Galeffi C, Nicoletti M, Messana I, Marini-Bettolo GB. Constituents of *Jacaranda mimosaeifolia*. *Rev Lat Quim.*(1988).19:17-19.
27. Binutu OA and Lajubutu B. *antimicrobial potentials of some plant species of the Bignoniaceae family*. *Afr J Med Med Sci.*(1994).23:269.
28. Lans C, Harper T, Georges K, Bridgewater E. Medicinal and ethnoveterinary remedies of hunters in Trinidad. *BMC complementary and alternative medicine.*(2001)1:1-10
29. Ospina LS, Olarte J, Nuñez E. *Phytopharmacological studies on a liposoluble fraction of Spilanthes americana (Mutis) flowers. Part I. Phytochemical studies*. *Rev Colomb Cienc Quim Farm.*(1986).15:37
30. Chakraborty A, Chowdhury BK, Bhattacharya P. Clausenol and clausenine-two carbazole alkaloids from *Clausena anisata*. *Phytochemistry.*(1995)40: 295-8
31. Sakharkar PR and Patil AT. *Antimicrobial activity of Cassia alata*. *Indian J Pharmaceutical Sciences.*(1998),60: 311-2.
32. Nair A and Bhide SV. *Antimicrobial properties of different parts of Semecarpus anacardium*. *Indian Drugs.*(1996),33: 323-8.
33. Padmaja V, Thankamany V, Hara N. *Biological activities of Amonaglabra*. *J Ethnopharmacol.*(1995), 48: 21-24.
34. Agnihotri S and Vaidya AD. *A novel approach to study anti-bacterial properties of volatile components of selected Indian medicinal herbs*. *Indian J Exp Biol*(1996),34: 712-5.

How to cite this article:

Tyagi R, Sharma G, Jasuja ND, Menghani E. Indian medicinal plants as an effective antimicrobial agent. *Panacea Journal of Pharmacy and Pharm. Sci.* 2017:6(1); 113-120.