# HERBAL PLANTS: AS SOURCE OF ANTI-MICROBIAL COMPOUNDS

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## Summary

In recent years, there is increase in interest in search of drugs derived from plants. Plants are rich source of wide variety of secondary metabolites, like tannins, terpenoids, alkaloids and flavanoids which have been found in vitro to have antimicrobial activity. The disadvantage of available antibiotics is development of resistance and becomes ineffective against some viruses and bacterias. So, it is required to have better antimicrobial agent have broad spectrum of activity and at the same side it should be safe. Plants constituents have wide range of structural variation, this provide discovery of new molecular structures as lead compounds. This review attempts to summarize some medicinal plant having antimicrobial activity. These plants are effective against microorganism in vitro. Phytochemicals of these plants are subjected to human and animals studies to known their effectiveness in whole body system.

**Key words**: Antimicrobials, Phytochemicals, Antibiotics,

## Introduction

"An apple a day keeps the doctor away". Healing powers in plant is an ancient idea. There has been a revival of interest in herbal medicines. This is due to increased awareness of the limited ability of synthetic pharmaceutical products to control major diseases and the need to discover new molecular structures as lead compounds from the plant kingdom. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicines. Various medicinal plants have been used for years in daily life to treat disease all over the world. They have been used as a source of medicine. In fact, plants produce a diverse range of bioactive molecules, making them a rich source of different types of medicines. Ethanopharmacologists, botanists, microbiologists and natural products chemists are combing the earth for phytochemicals and "leads" which could be developed for treatment of infectious diseases. Now a days for the infectious diseases large number of antibiotics are used, but antibiotics have their own disadvantages like toxic effects, resistance of microorganism. Many plant constituents are effective antimicrobials as well as safe. Phenols and phenolic acids are effective antimicrobial agents act by inhibiting enzyme (1).Quinones form complex with nucleophilic aminoacid in protein, leads to inactivation and loss of function of protein (2). Flavanoids also form complex with protein, more lipophilic flavanoids may also disrupt microbial membrane (3).

Along with other physiological activities, tannins are also effective antimicrobial agents. Tannins inactivate microbial adhesion, enzymes, cell envelopes transport protein etc. they also form complex with polysaccharides (4). Terpenoids and essential oils are also very effective antimicrobial agents. They are effective aginsts bacteria, fungi, viruses and protozoa (4). There are many other plant constituents which are also very effective broad spectrum antimicrobial agents.

**Following are some of the effective antimicrobial medicinal plants**.

| Plant name | Family | Effective against | Reference |
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| Pulicaria dysenterica | Compositae | Aqueous extract of the plant is effective against vibrio cholerae and B. cereus. Methanolic and chloroformic extract effective against vibrio cholerae and S. aureus. | 5 |
| Species of Glaucium G. grandiflorum, G. oxylobum, and G. paucilobum | Geraniaceae | The methanol and chloroform extracts were more active against Gram-negative microorganisms E. coli, P. aeruginosa, K. pneumoniae. The chloroform extracts were found to be most effective against S. aureus, S. sangui,, E. coli, P. aeruginosa, and K. pneumoniae | 6 |
| Chelidonium majus | Papaveraceae | The ethanolic extract of the root of this plant is effectve against B. cereus S. aureus | 7 |
| Sanguisorba officinalis | Rosaceae | Ethanolic extract of aerial parts of this plant is effective against S. aureus. The ethanolic extract of the rhizomes of this plant is effectve against B. cereus, S. aureus, E. coli, P. aeruginosa | 7 |
| Tussilago farfara | . Compositae | The ethanolic extract of aerial parts and rhizome is effective against B. cereus and S. aureus | 7 |
| Ocimum gratissimum | Labitae | The oil of this plant is effective against E. coli, S. aureus, S.typhi and S. typhimurium | 8 |

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| Pelargonium radula | Geraniaceae | The ethanolic extract of the plant is effective aginst 14 bacterial, 8 yeast, 5 mould and 3 dermotophyte strain. The most sensitive bacterias are E. coli, B. subtilis, B. pumilus, S. aureus, Salmonell spp and P. aeruginosa. | 9 |
| Piper regnellii | Piperaceae | Hydroalcoholic(90-10%)extract have good activity against S. aureus and B. subtilis, a moderate activity on P. aeruginosa, and a weak activity against E. coli | 10 |
| Punica granatum | Punicaceae | Hydroalcoholic(90-10%)extract showed good activity on S. aureus | 10 |
| Eugenia uniflora | Myrtaceae | Hydroalcoholic(90-10%)extract moderate activity on both S. aureus and E. coli | 10 |
| Sambucus canadensis | Caprifoliaceae | Hydroalcoholic(90-10%)extract shown moderate activity against B. subtilis | 10 |
| Carica papaya | . Caricaceae | Ethanolic extract of epicarp, endocarp and seeds have significant antibacterial activity on S. aureus, B.cereus, E. coli, P. aeruginosa and Shigella flexneri | 10 |

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| Bidens pilosa | Asteraceae | The water extracts showed a higher activity against B. cereus and E. coli. Ethanol extracts of all species were active against S. aureus | 11 |
| Jacaranda mimosifolia | Bignoniaceae | The water extracts effective against B. cereus and E. coli. Ethanol extracts of all species were active against S. aureus | 11 |
| Piper pulchrum | Piperaceae | The water extracts showed a higher activity against B. cereus and E. coli. Ethanol extracts of all species were active against Staphylococcus aureus | 11 |
| Hedychium larsenii | Zingiberaceae | Oil is effective against B. cereus, B. subtilis, S. aureus. P. vulgaris,P. aeruginosa, P. fluorescens, S. typhi, S. marcescens | 12 |
| Syzyium aromaticum | Myrtaceae | Hot water, methanol and ethanol extracts Methicillin-resistant Staphylococcus aureus(MRSA) and B. subtilis, multidrug resistant P. aeruginosa and enterohemorrhagic E. coli | 13 |
| Cinnamomum cassia | Lauraceae | Hot water, methanol and ethanol extracts Methicillin-resistant Staphylococcus aureus(MRSA) and B. subtilis | 13 |

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| Salvia officinalis | Lamiaceaea | Hot water, methanol and ethanol extracts Methicillin-resistant Staphylococcus aureus(MRSA) and B. subtilis, multidrug resistant P. aeruginos aand enterohemorrhagic E. coli | 13 |
| Thymus vulgaris | Lamiaceaea | Hot water, methanol and ethanol extracts Methicillin-resistant Staphylococcus aureus(MRSA) and B. subtilis, multidrug resistant P. aeruginosa and enterohemorrhagic E. coli | 13 |
| Rosmarinus officinalis | Labiatae | Hot water, methanol and ethanol extracts Methicillin-resistant Staphylococcus aureus(MRSA) and B. subtilis | 13 |
| Melissa officinalis | Labiatae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Rhus coriaria L. | Anacardiaceeae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Dianthus coryophyllum | Caryophyllaceae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |

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| Piper nigrum | Piperaceae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Capsicum annum L. | Solanaceae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Erica arborea | Ericaceae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Colutea arborescens | Leguminosae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Cuminum cyminum | Umbelliferae | Ethanolic extract is effective against E. coli, B. subtilis, S. aureus, S. epidermidis, P. aeruginosa | 14 |
| Combretum micranthum | | Polyphenols of leaves is effective against S. dysenteriae, S. parathyphi B, K. ozenae, S. flexneri, S. boydii, S. thyphi, K. pneumoniae, S. aureus, S. aureus | 15 |

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| Khaya senegalensis | Meliaceae | Polyphenols of Bark is effective against S. parathyphi B, S. aureus, S. aureus, S. dysenteriae Polyphenols of Leaves is effective against S. dysenteriae, S. aureus and S. aureus, S. parathyphi B, K. ozenae | 15 |
| Sida acuta | Malvaceae | Whole plant is effective against S. dysenteriae, S. parathyphi B, S. aureus, K. ozenae | 15 |
| Diplotaenia damavandica | | Oils is effective against B. subtilis, S. aureus, S. epidermidis and E. coli | 15 |
| Juniperus communis | Cupressaceae | Essential oil is effective against B. cereu, B. subtilis,M. flavus, M. luteus,S. aureus, S. aureus,S. epidermidis, E. faecalis, Serratia spp. S. enteritidis, P. mirabilis, S.sonnei, K. oxytoca | 16 |
| Psidium guajava | Myrtaceae | Methanolic extract is effective against B. anthracis, B. cereus, C. sporogenes, C. pyogenes, E. coli, K. pneumoniae, P. aeruginosa, P. fluorescens | 17 |

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| Mangifera indica | Anacardiaceae | Methanolic extract is effective against C. sporogenes, C. pyogenes, E. coli, K. pneumoniae, P. aeruginosa, P. fluorescens, S. dysenteriae, S. aureus, S. faecalis | 17 |
| Eucalyptus | Myrtaceae | Oil is effective against Psuedomonas spp. Proteus spp, methicillin resisitance. S. aureus. | 18 |
| Aloe barbedensis | Liliaceae | Latex is effective against salmonella, streptococcus, S, aureus, Coyenebacterium | 19 |
| Matricaria chamomilla | Compositae | Phenolic acid is effective against M.tuberculosis, S.typhimurium, S. aureus | 20 |
| Panax notoginseng | Araliaceae | Saponins are effective against E.coli, Staphylococcus | 20 |
| Podocarpus nagi | Podocarpaceae | Flavon are effective against P.acne and other Gram positive bacteria | 21 |
| Mimosa pudica | Fabaceae | Hydoalcoholic extract is effective against B.subtilis, S. aureus, K. pneumoniae, P. aeruginosa, E.coli, S. typhi | 22 |

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| Aegle marmelos | Rutaceae | Hydoalcoholic extract is effective against B. subtilis, S. aureus, K. pneumoniae, P. aeruginosa, E.coli, S. typhi | 22 |
| Sida cordifolia | Malvaceae | Hydoalcoholic extract is effective against B. subtilis, S. aureus, K. pneumoniae, P. aeruginosa, E.coli, S. typhi | 22 |
| Bergenia ciliata | Saxifragaceae | Root and leaves extract were promising against gram positive and gram negative bacteria viz. B. subtilis, B. megaterium and P. aeruginosa | 23 |
| Acorus calamus | Acoraceae. | Methanolic extract of rhizome is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |
| Centella asiatica | Apiaceae. | Methanolic extract entire plant is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |
| Justicia adhatoda | Acanthaceae | Methanolic extract leaves is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |
| Zanthoxylum armatum | Rutaceae | Methanolic extract fruits is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |

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| Vernonia anthelmintica | Compositae | Methanolic extract seeds is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |
| Myrica esculenta | Myricaceae | Methanolic extract bark is effective against S. aureus, E.coli, P. aeruginosa, S. boydii | 24 |

## Conclusion

Many plants are effective against wide range of bacteria, fungi and viruses including HIV, which can produce very severe infection in human being. Now a day many plant products available in market for treatment of infection. But it is required to estimate the purity of product and to authentify the phytochemicals. It should be required that products containing botanical ingredients specify the part of the plant used. It would be advantageous to standardize methods of extraction and in vitro testing so that the search could be more systematic and interpretation of results would be facilitated. All the phytochemicals should be studied for their toxicity and safety.

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