

A Review article on phytoconstituents for antibacterial property: an update on plant-derived compounds.

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Date Of Submission: 01-03-2021

Date Of Acceptance: 10-03-2021

ABSTRACT: The Antibacterial activity of phytochemicals which are secondary metabolites mostly produced by higher plants which makes vulnerable to survive under various biotic and abiotic stresses. Reports have been exhibited that these phytoconstituents have direct and indirect effects on bacterial physiology. Among them, the flexibility of some plant derived compounds to suppress or eradicate the pathogenic bacteria with various mode of actions like alkaloids, terpenoids, carotenoids, and a few sulfur-containing phytochemicals. Such phytochemical molecules are suggested to fulfill the necessity for brand spanking new antibacterial drugs to beat the treatment of resistant bacterial pathogens. This review is aimed to demonstrate some phytochemical molecules which showed potent antibacterial activity and will help future researchers performing on antibacterial drugs.

KEY WORDS: Antibacterial, secondary metabolites, phytochemicals, pathogenic.

I. INTRODUCTION:

Mother nature has always been an abundant source of phytochemicals, which are obtained from the plants since over 60,000 years ago. The importance of herbs in the management of bacterial infection is immaculate. The plant comprises of an inexhaustible source of phytochemicals very useful in the management of many intractable bacterial infections. Furthermore, the phytochemicals have the advantage of being combined with many other substances that appear to be inactive, but after combination shows destructive action on bacterial species. Although, these complementary components provides the plant with safety and efficiency much superior to that of its isolated and pure phytochemicals.

The continued use of medicinal plants as a remedy to its marvelous ability of producing various bioactive secondary metabolites known as phytochemical compounds. In recent years, despite huge advances in antibiotic therapies, the improper consumption and wrong execution of antibiotics to

cope with pathogenic infections, have led to growth of multi-drug resistant bacteria which showed resistance against almost every known antibiotics, this was turning out to be dangerous to human health and the need for alternative other than drugs we used before. Many scientific researches brought about that phytochemical compounds that were extracted from plants showed antibacterial potential against multi-drug-resistant pathogens and these compounds could be used as antibacterial drugs. The potential of some phytochemicals as promising antibacterial drugs proved out to be astonishing. The review is aimed at reviewing the phytochemical compounds which acts as potential antibacterial agent.

India being a peninsular country, we have not yet looked into our marine resources like countries such as South Korea, China, Japan or Taiwan. Current research in the field of drug discovery and development involve the study of "secondary metabolites". Marine algae are such secondary metabolites which are an broad-gauged component of traditional medicine in several Asian countries. They provide a wide range of bioactive compounds which has been shown to exhibit activity against bacteria.

Plant secondary metabolites can be classified into four main categories;

- (i) Phenolic compounds includes flavonoids, tannins, chalcones, coumarins and phenolic acids.
- (ii) Terpenes includes hemiterpenes, monoterpenes, sesquiterpenes, diterpenes, sesterpenes, triterpenes, tetraterpenes and polyterpenes,
- (iii) Nitrogen-containing compounds such as non-protein amino acids and alkaloids, and Phytochemical Compounds as Antibacterial Agents
- (iv) Sulphur-containing compounds such as glucosinolates, alliinins, defensins and lectins . Plant secondary metabolites are known also as phytochemical compounds, these

phytochemicals were reported having direct or indirect effects on the bacterial cells; Some phytochemical compounds showed bioactive effects such as stimulation of the immune

system, modulation of enzyme actions, modulation of hormone metabolism, pain-relieving properties.

Phytochemical Compounds as Antibacterial Agents

Table: Few phytochemicals from plants

Phenolic compounds:

Plant Name	Scientific Name	Part Used	Susceptible Bacteria
Pomegranate	Punicagranatum	Peels of the fruit	Staphylococcus aureus
Rue	Rutagraveolens	Leaves	Bacillus subtilis
Nutmeg	Myristicafragrans	Seed kernel inside the fruit	Providenciastuartii ATCC299645
Mango	Mangiferaindica	Kernel	Propionibacterium acnes

TERPENOIDS:

Plant Name	Scientific Name	Part Used	Susceptible Bacteria
Guaitecas Cypress	Pilgerodendronuviferum	Wood and bark	Gram positive and gram negative
Shining poverty bush	Eremophilalucida	Leaves	Staphylococcus aureus ATCC 29213, Staphylococcus aureus ATCC 25923
Sarangsemut	Myrmecodiapendans	Areal parts	Streptococcus mutans

ALKALOIDS:

Plant Name	Scientific Name	Part Used	Susceptible Bacteria
Common red, crimson or lemon bottlebrush	Callistemon citrinus	Leaves	Staphylococcus aureus ATCC 9144
Trailing Eclipta Plant	Eclipta alba	Leaves	Staphylococcus aureus Escherichia coli
Twin-apple	Ochrosiaoppositifolia	Leaves, stembark, and roots.	Bacillus subtilis, Vibrio fluvialis
Mesquite	Prosopisjuliflora	Leaf, pod and flowers	Salmonella sp., Escherichia coli.

CAROTENOIDS:

Plant Name	Scientific Name	Part Used	Susceptible Bacteria
Guiera	Guierasenegalensis	Galls	Salmonella typhimurium ATCC 13311
Annatto	Bixaorellana	Fruits	Staphylococcus aureus

PHENOLIC COMPOUNDS:

Phenolic compounds is a bioactive phytochemical molecule. There are many plants which show antibacterial activity from which phenolic compounds are extracted from various parts. The mango fruit from family Mangiferaindica, the kernel is used for antibacterial

activity against some acne causing bacteria such as Propionibacterium acnes.

TERPENOIDS:

Terpenoids contains fourty thousand compounds which puts them as one of the largest class of phytochemicals. They are used as flavors,

frangrances, and pharmaceutical compounds. The Sarangsemut of family Myrmecodiapendans, the areal parts are used to extract terpenoids which show activity on Streptococcus mutans.

ALKALOIDS:

They are one of the largest and diverse group they are collected from various plants together there are around twelve thousand alkaloids. The Mesquite plant from family Prosopisjuliflora of which leaf, pod and flowers are used to treat Salmonella sp.

CAROTENOIDS:

Carotenoids are important class of bioactive properties, they are lipid phytochemical metabolite. There are around six hundred known carotenoids which are isolated from various plants. They produce pigments for coloring fruits and vegetables it is one of their major roles. The studies related to carotenoids used as antibacterial are very less. Still some plants show remarkable action like Annatto from family Bixaorellana of which fruits are used against staphylococcus aureus bacteria.

II. CONCLUSION:

As we all know from past few decades the study of plants has proved to be enormous stride in the treatment of many irremediable bacterial infections and they are proving out to be a resourceful source for new anti bacterial drugs. Mother earth consists of tremendous plants which are yet to be studied and there are plants on which studies are going on. Herbal medicine has started to gain spotlight day by day, and providing new naturally occurring antibacterial drugs in the pharmaceutical market. Even though the extraction and drug preparation of antibacterial phytochemicals needs a ton of work to be done, to ensure there is no toxicity and is safe. This is proving out to be a promising field for pharmaceutical industry as it solely depends on nature.

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