

Antimicrobial Activity of Natural Products- Moyeen Bakar - King's College Hospital NHS

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Introduction

In the recent years, research on medicinal plants has attracted a lot of attentions globally. Large body of evidence has accumulated to demonstrate the promising potential of Medicinal Plants used in various traditional, complementary and alternate systems of treatment of human diseases. Plants are rich during a big variety of secondary metabolites like tannins terpenoids, alkaloids, flavonoids, etc, which are found in vitro to have antimicrobial properties.^{1,2} Clinical microbiologists have two reasons to be interested in the topic of antimicrobial plant extracts. First it is very likely that these phytochemicals will find their way into the arsenal of antimicrobial drugs prescribed by the physicians; several are already being tested in humans. Scientists realize that the effective lifetime of any antibiotic is limited, so new sources especially plant sources are also being investigated. Second the public is becoming increasingly aware of the problems with the over prescription and misuse of traditional antibiotics. In addition many people are interested in having more autonomy over their medical care. A multitude of plants compounds (often of unreliable purity) is quickly available over the counter from herbal suppliers and national food stores and the Self medication with these substances is a common practice to certain extent.

A highlights the various Medicinal plants which have shown antibacterial, antifungal antiviral and antiprotozoal properties whereas in section B the most focus is on the various groups of phytochemicals exhibiting medicinal properties.

ANTIMICROBIAL ACTIVITY OF NATURAL PRODUCTS FROM MEDICINAL PLANTS

In a study carried out by Chakraborty and coworker it has been observed that a carbazole alkaloid

“clausenol” isolated from an alcoholic extract of the stem bark of clausena anisata possesses antibacterial and antifungal activity. The acetone and alcoholic extracts of the leaves of Cassia alata showed significant invitro antibacterial activity against Staphylococcus aureus, coagulase positive Staplylococcus aureus, Bacillus subtilis, Bacillus stearothermophilus, Escherichia coli, Salmonella typhi and Salmonella dysenteriae. Further, alcoholic extracts also inhibited the growth of Klebsiella pneumoniae where as the acetone extract inhibited the growth of Vibrio cholerae.⁴ The Alcoholic extract of dry nuts of Seme carpus anacardium (Bhallatak) showed bactericidal activity in vitro against 3 gram negative strains (Escherichia coli, Salmonella typhi and Proteus vulgaris) and 2 gram positive strains (Staphylococcus aureus and Corynebacterium diphtheriae). Subsequent studies have shown that the alcoholic extracts of different parts of the plant (leaves, twigs green fruits) also possess antibacterial properties especially the leaf extract. Substantial antibacterial, antifungal and moderate insecticidal, sporicidal and cytotoxic activities were observed with the hexane extract of the stem bark of Amona glabra. Chromatographic fractionation of the stem led to the isolation of kaur¹⁶-en, 19-oic acid, which was found to be largely responsible for its biological activities. Keeping in view the difficulties encountered with aromatic oils thanks to lack of ideal diffusion and evaporation in disc diffusion methods, Agnihotri and Vaidya developed a novel approach for studying antibacterial properties of certain plants like Eugenia caryophyllus, Thymus vulgaris, Cinnamomum zeylanium and Cuminum cyminum Volatile components of the hexane extracts of these plants were tested against standard gram positive and gram negative bacteria grown on agar slants selected, Thymus vulgaris had the most prominent antibacterial activity.

Abstract

Antimicrobial agents are classified according to the spectrum of their action. They have many roles by acting as antifungal, antiviral and antiprotozoal action. They also have essential functions i.e. inhibiting bacterial cell wall synthesis, nucleic acid synthesis and many more. Medicinal plants are significantly useful and economical. Antimicrobial agents are essentially important in reducing the global burden of infectious diseases. With the irrational and excessive use of antibiotics in underdeveloped and developing countries, there may be chances to develop and spread resistant pathogens in the community. Therefore, the need for novel alternative antimicrobial strategies has renewed interest in natural products like turmeric, honey, ginger and others exhibiting antibacterial properties. Antimicrobial resistance (AMR) is emerging at an alarming rate as mortality due to resistant pathogens. Since AMR is against all clinically utilized antibiotics, finding novel antimicrobials with unexploited targets remains the main goal worldwide. The research is to determine the natural product has the best antimicrobial activity by looking at various fruits, plants and other natural resources. The project was a latest literature based to find the best antibacterial activity and therefore the existing research journals were used. This indicates a range of antimicrobial activity of natural products against pathogens. Of the raw natural products, garlic juice had the highest activity. The most active processed products were peppermint oil and the four pure compounds trans-cinnamaldehyde, allicin, menthol and zingerone. Bacteroides species has similar susceptibility to C. difficile to most natural products; Lactobacillus casei was less susceptible. It is worthy to consider honey as a promising future antimicrobial to be tested and studied. Honey, may be elaborately used in future with some more molecular studies on

its method of action as an antimicrobial agent. Our efforts now focus on purifying these compounds, elucidate their structures and study their mode of action.