

Antibiotic Resistance and Anti-Microbial Activity of Medicinal Plants

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Infectious diseases, the world's second leading cause of premature deaths, kill almost 50,000 people every day. To check the death use of antibiotic started but the use was so rampant and indiscriminate that microorganism started developing resistance. It is reported that approximately 70 per cent of known bacteria today have developed resistance to one or more antibiotics either by altering the cellular target site of the antibiotic or by replacing and altering the method through which the antibiotic enters the cell or by secreting enzymes to degrade antibiotics. This is specially applicable for the bacteria like *Streptococcus pyogenes*, *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Clostridium difficile*, *Mycobacterium tuberculosis*, *Neisseria gonorrhoeae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* etc. This has created immense problem in treatment of infectious diseases. The problem is so severe that antibiotic resistance is now considered a worldwide public health problem [1,2].

To combat the situation continuous effort was going on for synthesis of new chemicals having antimicrobial activity [3]. Lot of chemicals were synthesized in laboratory which established their anti-microbial activity [4]. Unfortunately, most of these compounds are potentially toxic and are not free from side effects on the host. This has extended the research even in the field of medicinal plants for search of natural compounds which will be less toxic and will act as a proper substitute of chemical antimicrobial agents [5]. Several plants have already been identified for their antimicrobial properties. Few of them are *Abutilon indicum* (Family, Malvaceae), *Alangium salvifolium* (Family, Alangiaceae), *Allium sativum* (Family, Alliaceae), *Bergenia ligulata* Wall (Family, Saxifragaceae), *Mangifera indica* (Family, Anacardiaceae), *Bombax ceiba* (Family, Bombacaceae), *Kalanchoe pinnata* (Family, Crassulaceae), *Syzygium cumini* (Family, Myrtaceae), *Carica papaya* (Family, Caricaceae), *Centella asiatica* (Family, Apiaceae), *Coriandrum sativum* (Family, Apiaceae), *Curcuma longa* (Family, Zingiberaceae), *Emblia officinalis* (Family, Euphorbiaceae), *Ficus benghalensis* (Family, Moraceae), *Glycyrrhiza glabra* (Family, Leguminosaceae), *Mangifera indica* (Anacardiaceae), *Mimosa pudica* (Family, Mimosaceae), *Morinda citrifolia* (Family, Rubiaceae), *Ricinus communis* (Family, Euphorbiaceae), *Sida cordifolia* (Family, Malvaceae), *Terminalia bellerica* (Family, Combretaceae), *Tinospora cordifolia* (Family, Menispermaceae), *Woodfordia fruticosa* Kurz. (family, Lythraceae) etc [6].

Antimicrobial activity of medicinal plant is due to presence of different groups of compounds. Major groups are: quinones (hypericin), flavonoids (chrysin), flavonols (tatarol), tannins (ellagitannin), coumarins (warfarin), simple phenols (catechol, epicatechin), phenolic acids (cinnamic acid), alkaloids (berberine piperine), terpenoids and essential oils (capsaicin), lectins and polypeptides (mannose-specific agglutinin fabatin) etc. Mechanism of anti-microbial activity of these group of compounds was explored. While quinones, flavonoids and flavonols bind to adhesins, form complex with cell wall and inactivate enzymes, tannins bind with proteins, adhesins as well as initiate enzyme inhibition, substrate deprivation, complex with cell wall, membrane disruption etc. Coumarins interact with eukaryotic DNA (antiviral activity). While simple phenols and phenolic acids can augment substrate deprivation and membrane disruption, terpenoids and essential oils do only membrane disruption. Lectins and polypeptides, however, block viral fusion or adsorption [7].

In spite of all the known facts use of these group of compounds as antibiotic is not common. This is due to lack of clinical trial. Most of the research on anti-microbial activity of medicinal plants was concentrated up to the experimental stage. Plants having antimicrobial activity were identified and antimicrobial compounds were isolated. After that majority of the researchers were not involved in clinical trial of the isolated anti-microbial compounds.

It is to be remembered that earth has about two to five lacs known plant species and out of them only a small fraction have been investigated for antimicrobial activity. Considering the present day danger of antibiotic resistance, it is the need of hour to undertake thorough screening program on antimicrobial activity of medicinal plants specially the untouched medicinal plants, to standardize the extraction process, to isolate antimicrobial compound from the plant - its characterization and, above all, to take the research up to the level of clinical trial. Then and there only we will have new antibiotics from plant sources to get rid of antibiotic resistance thereby supporting the theme of the World Health Day 2011.

Antimicrobial resistance: no action today, no cure tomorrow.

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