



EFFECT OF MINT LEAVES EXTRACT ON MDR PATHOGENS: A COMPARATIVE STUDY

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Article Received on 13/03/2015

Article Revised on 05/04/2015

Article Accepted on 28/04/2015

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ABSTRACT

In the present study antimicrobial activity of crude Mint (*Mentha arvensis*) leaves extract observed in comparison with Standard antibiotics Cholistin, Erythromycin, Ciprofloxacin, Methicillin, Ampicillin and Cephalosporin. In this study, the antimicrobial efficacy of crude Mint leaves extract was examined and tested against following bacterial cultures those were *Salmonella typhi* (5 strains),

E.coli (8 strains), *Shigella sonnei* (7 strains) and *Shigella flexinaria* (8 strains). As microorganisms becoming resistant to present day antibiotics, our study focuses on antimicrobial activity of Mint leaves extract in comparison with standard antibiotics against selected enteric pathogens. Antimicrobial analysis was done by using agar well diffusion method against selected enteric pathogens. Natural product may act as a substitute for antibiotics and chemotherapeutic agents in certain conditions. Historically, plants have provided a source of motivation for novel drug compounds, as plant derived medicines have made great contributions to human health and welfare. Medicinal plants correspond to a rich source of biological agents which play very important role in a number of functional and regulation mechanisms occurring in plant as well as in animal body. In the present investigation, Mint leaves extract showed highest antibacterial activity against *Salmonella typhi* strain V (ZOI- 16mm), *E.coli* strain VII (ZOI- 18mm), *Shigella sonnei* strain VI (ZOI- 20mm) and *Shigella flexinaria* strain V (ZOI- 16mm). *Salmonella typhi* strain III, *Shigella sonnei* strain III, *Shigella flexinaria* strain VI showed no ZOI with Mint leaves extract. ie these strains were observed resistant to Mint leaves extract. All bacterial strains were also observed resistant to all tested antibiotics. So the present study shows that, these tested multidrug resistant organisms were observed resistant to studied standard antibiotics but those were observed sensitive to crude Mint leaves extract.

KEYWORDS: Antimicrobial activity, *Mentha arvensis*, Enteric pathogens, Standard antibiotics etc.

INTRODUCTION

Plants have been a prospective source of medicine; though in a crude form, have been used from time immemorial to cure various ailments. The conventional herbal medical system has been practiced internationally from ancient times; as a result, a great volume of literature is available on the antimicrobial activity of a variety of plant species. It is supposed that drugs developed from plant sources may have minimum and very slow to induce drug resistance among the pathogens. From this perception, it is essential to screen a variety of plants with potential antimicrobial activity for periodical introduction to control the drug resistance among the human pathogens.

Medicinal plants are necessary part of human society since the civilization started. Medicinal plants are the boon of nature to treat a number of ailments of human beings. In many parts of the world medicinal plants are used against bacterial, viral and fungal infections. Estimation of plants bearing effectiveness in curing various diseases is growing in recent years. The demand for herbal products is caused by population enhance, poverty, increasing awareness of herbal products, high price of modern medicine and limited access to trained doctors. The nature of medicinal plants and parts vary from one locality to another and their use depends on the local native information and knowledge present over countries. Recent research has paying attention on the natural plant products alternatively for disease control and treatment. Medicinal plants are cheaper, more accessible to the majority of the population in the world. Thus, there is need to encourage the use of medicinal plants as potential sources of new drugs.

Medicinal plants are plants which contain substances that could be used for therapeutic purposes or which are precursors for the synthesis of useful drugs.^[1] Medicinal plants, since time immemorial have been used in almost all cultures as a basis of medicine. The extensive use of herbal remedies and healthcare preparations, as those described in ancient and holy texts such as the Vedas and Bible and obtained from commonly used traditional herbs and medicinal plants has been traced to occurrence of natural products with medicinal properties. There are hundreds of medicinal plants that have a long history of medicinal properties against various diseases and ailments.

However, screening of plants for their action is very important and needs urgent attention in order to know the significance of the plant. Recent researches on natural molecules and products primarily focus on plants since they can be screened more simply and can be selected based on their ethnomedicinals. [2] The progress of multiple antibiotic resistance organisms has constituted a worldwide problem as far as treatment of some infectious diseases is concerned. Infectious disease still remains a significant cause of morbidity and mortality in man, especially in developing countries. Microorganisms have developed resistance to several antibiotics and this has produced immense clinical problem in the management of infectious diseases. [3]

The enhance in resistance to microorganisms due to indiscriminate use of antimicrobial drugs forced scientists to search for new antimicrobial substances from various sources including medicinal plants. [4] Medicinal plants might represent an alternative treatment in non-severe cases of enteric disorders. They can also be a probable source for new potent antibiotics to which pathogenic strains may not be resistant. [5] Thus there is an enormous necessity to search for the significance of natural plant remedies.

Medicinal plants correspond to a rich source of biological agents which play very important role in a number of functional and regulation mechanisms occurring in plant as well as in animal body. Mint is aromatic, almost exclusively perennial, rarely annual herb. They have wide spreading rhizomes and erect, branched stems. The leaves are arranged in opposite pairs, from simple oblong to lanceolate, often downy and with a serrated margin. Mint was originally used as a medicinal herb to treat stomach ache and chest pains. The leaf, fresh or dried, is the culinary source of mint. Mint leaves are used in teas, beverages, syrups, candies and ice creams. Treatment of diseases with modern medicine is often and generally associated with the development of side effects. Hence the plant products have been increasing worldwide, to lower side effects.

MATERIALS AND METHODS

Collection of Plant Material

Healthy disease free, indigenously grown mature leaves of Mint was purchased from local market of Solapur (M.S.). The identification of plant material was confirmed by a Botanist in the Dept. of Botany, Walchand College of Arts and Science, Solapur (M.S.).

Test Pathogens

Various strains of Enteric pathogenic bacterial cultures were used in this study. Those were *Salmonella typhi* (5 strains), *E.coli* (8 strains), *Shigella sonnei* (7 strains) and *Shigella flexinaria* (8 strains). The pure pathogenic bacterial strains were collected from Dept. of Microbiology, V.M. Govt. Medical College, Solapur (M.S.) and Ashwini Sahakari Rugnalaya NYT. And Research Centre, Solapur (M.S.). The cultures were isolated and identified by using standard biochemical tests. The cultures were maintained on nutrient agar slants at 4⁰C and subcultured for 24hr. before use.

Preparation of Leaves Extracts

Thoroughly washed mature leaves of Mint plants were shade dried and then powdered with the help of electric blender. Twenty five gram powder was put into boiling water and allowed to settle for 2hr. After settling the extract was collected and preserved at 5⁰C in airtight bottle until further use.

Antibacterial Activity Assay

Antimicrobial activity of the Mint leaves extract was determined by agar well diffusion method on Muller- Hinton agar medium.^[6] Cups are made on Muller- Hinton agar plates using cork borer and inoculum containing 10⁶ CFU/ml of pathogenic bacteria were spread on the solid plate with the help of sterile glass rod. Then 100ul of crude Mint leaves extract was placed in the cups made in inoculated plates. All the plates were incubated for 24hr. at 37⁰C. and after incubation period zone of inhibition was measured in mm. Antimicrobial activity of Standard antibiotics Cholistin, Erythromycin, Ciprofloxin, Methicillin, Ampicillin and Cephalosporin were also observed in comparison with Mint leaves extract.

STATISTICAL ANALYSIS

The resultant clear zones around the well were measured in mm. The antibacterial activity of crude Mint leaves extract was indicated by clear zones of growth inhibition. Three replicates were maintained for each treatment. Each value represents mean of three different observations \pm S.D. The data were subjected to statistical analysis as per the method of Gomez and Gomez.^[7]

RESULTS AND DISCUSSION

In the present study significant antibacterial activity is observed by crude Mint leaves extract against selected enteric pathogens. The antimicrobial activities of Mint leaves extract was represented in table 1. In the present study antimicrobial activity of crude Mint leaves extract was observed in comparison with Standard antibiotics Cholistin, Erythromycean, Ciprofloxin, Methicillin, Ampicillin and Cephalosporin. For the present study following bacterial cultures were used those were *Salmonella typhi* (5 strains), *E.coli* (8 strains), *Shigella sonnei* (7 strains) and *Shigella flexinary* (8 strains).

Mint leaves extract showed highest antibacterial activity against *Salmonella typhi* strain V (ZOI-16mm), *E.coli* strain VII (ZOI- 18mm), *Shigella sonnei* strain VI (ZOI- 20mm) and *Shigella flexinary* strain V (ZOI- 16mm). *Salmonella typhi* strain III, *Shigella sonnei* strain III, *Shigella flexinary* strain VI showed no ZOI with Mint leaves extract. ie these strains were observed resistant to Mint leaves extract. All tested bacterial strains were observed resistant to all tested antibiotics. These tested multidrug resistant organisms were observed resistant to studied standard antibiotics but those were observed sensitive to crude Mint leaves extract.

Previous studies showed the presence of tannins and flavanoids in the Mint leaves extract. A correlation has been reported between the phytochemicals such as tannins and flavanoids and the free radical scavenging activity and antibacterial activity.^[8] Tannins and flavanoids have therapeutic uses due to their anti-inflammatory, anti- fungal, antioxidant and healing properties.^[9] Gupta *et al.*^[10] has found alkaloids, glycosides, steroids and sugars in the aerial parts of Mint which substantiates our results.

As the alkaloids constitute one of the largest groups of phytochemicals in plants and medicinally highly effective, thus has led to the development of powerful painkiller medicines. Previous studies have shown that the leaves of Mint are good source of polyphenols.^[11] Tannins are also phenolic compounds^[12] and effective for the treatment of inflamed tissues. Flavonoids have been referred to as nature's biological response modifier, because of strong experimental evidence of their inherent ability to modify the body's reaction to allergies; hence, possess anti- allergic potential.^[13]

The continuous spread of multidrug-resistant pathogens has become a serious threat to public health and a major concern for infection control practitioners worldwide. However, overuse of antibiotics has become the major factor for the emergence and dissemination of multi-drug resistant strains of several groups of microorganisms including enteropathogens. Still a large

segment of population in the world relies upon traditional system of medicine. Therefore there is an urgent need for improved management and investigation of those plants which will be effective against multidrug-resistant pathogens. The results obtained in this study suggest that the crude Mint leaves extract can be used as potential source of drugs in the treatment or control of intestinal disorders.

Table 1: Antimicrobial Activity of Crude Mint Leaves Extracts.

M/O	Strains with ZOI in mm (Mean \pm SD)							
	I	II	III	IV	V	VI	VII	VIII
<i>Sal.typhi</i>	15 \pm 0.96	14 \pm 0.43	00®	13 \pm 0.17	16 \pm 0.26	-	-	-
<i>E.coli</i>	15 \pm 0.62	14 \pm 0.34	13 \pm 0.70	12 \pm 0.10	15 \pm 0.79	14 \pm 0.36	18 \pm 0.26	15 \pm 0.81
<i>Shigella sonnei</i>	15 \pm 0.62	14 \pm 0.36	00®	13 \pm 0.62	15 \pm 0.88	20 \pm 0.62	18 \pm 0.72	-
<i>Shigella flexinary</i>	14 \pm 0.10	13 \pm 0.17	12 \pm 0.62	15 \pm 0.72	16 \pm 0.55	00®	15 \pm 0.72	14 \pm 0.34

(®- Resistant Strain, - = No Strains).

CONCLUSION

As the global scenario is now changing towards the use of non-toxic and eco-friendly products, development of modern drugs from traditional medicinal plants should be emphasized for the control of various human and animal diseases. Plants are the basic source of knowledge of modern medicine. The basic molecular and active structures for synthetic fields are provided by rich natural sources. This burgeoning worldwide interest in medicinal plants reflects recognition of the validity of many traditional claims regarding the value of natural products in health care. The relatively lower incidence of adverse reactions to plant preparations compared to modern conventional pharmaceuticals, coupled with their reduced cost, is encouraging both the consuming public and national health care institutions to consider plant medicines as alternatives to synthetic drugs. The past decade has witnessed a tremendous resurgence in the interest and use of medicinal plant products.

The present study suggested that, the crude Mint leaves extract have a great potential as antimicrobial agents against selected enteric pathogens and they can be used as an alternative medicine in the treatment of enteric disorders. The antimicrobial activity assays showed promising evidence for the antimicrobial activity of Mint leaves extract against selected enteric pathogens. In the present study the tested multidrug resistant organisms were observed resistant to studied standard antibiotics but those were observed sensitive to crude

Mint leaves extract. Therefore, the Mint leaves extract could be seen as a good source for useful drugs.

ACKNOWLEDGEMENT

The authors are grateful to Head, Dept.of Microbiology, Dr.V.M.Government Medical College and Ashwini Sahakari Rugnalaya NYT. And Research Centre Solapur (M.S.) for provision of pure cultures of Enteric Pathogens.

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