CHAPTER - 9

DISCUSSIONS & CONCLUSIONS

In the past decade there has been renewed attention and interest in the use of traditional medicine globally. Medical plants continue to provide health security to millions of rural people all over the world. According to WHO estimated (Farnsworth and Soejorto, 1991), over 80% of people in developing countries depend on traditional medicines for their primary health needs. In India the coverage of rural population by the modern health system varies between different regions from three to thirty percent (Shankar, 1992; Shankar and Majumdar 2001). Millions of rural households in India use medicinal plants in a self help mode. Thus, for some 4-5 million people, traditional medicine is the only alternative source of health in the absence of the ailing government run healthcare systems. They are supported by over one million traditional, village based carriers of the herbal medical traditions (Marma chikitsa in traditional medicine, LSPSS monograph, 1993). Medicinal plants represent a rich source of anti-microbial agents. Plants are used medicinally in different countries and are a source of many potent and powerful drugs.

Nowadays, multiple drug resistant strains have been developed due to the indiscriminate use of commercial anti-microbial drugs commonly used for infectious diseases treatment. Unfortunately, bacteria have the genetic ability to transmit and acquire resistance to drugs and chemicals (Nascimento et al., 2000). Beyond the increasing prevalence of antibiotic resistance among pathogenic bacteria, undesirable side effects of some synthetic antibiotics add urgency to the search for new infection-fighting strategies, as well. Scientists and pharmaceutical
industries consider medicinal plants as a good choice, because these natural resources have ordinary fewer side effects, are costless and effective against broad spectrum of antibiotic resistant bacteria.

In many parts of the world, the extracts of medicinal plants are used for their anti-bacterial, anti-fungal and anti-viral properties (Hassawi and Kharma, 2006). Plant species used in folk medicine are potential for discovering extracts with active biological compounds that have anti-bacterial activity. Plants are important source of potentially useful structures for the development of new chemotherapeutic agents. The first step towards this goal is the *in vitro* anti-bacterial activity assay (Doughari, 2006).

Due to the increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents have lead to the screening of several medicinal plants for their potential anti-microbial activity therefore the present study was conducted to evaluate the anti-bacterial and anti-fungal activity of crude methanolic extract of five medicinal plants. The plants in the study were used to prepare methanolic extracts and phyto-chemical analysis was also performed for these methanolic extracts of the plants undertaken study.

2005, Govindarajan, Vijayakumar, Singh, Rao, Shirwaikar, Rawat and Pushpangadan, 2006). Some of these observations have helped in identifying the active principle responsible for such activities and in the developing drugs for the therapeutic use in human beings. However, not many reports are available on the exploitation of anti-fungal or anti-bacterial property of plants for developing commercial formulations for applications in crop protection.

The potential of higher plants as source for new drugs is still largely unexplored. Among the estimated 250,000-500,000 plant species, only a small percentage has been investigated phytochemically and the fraction submitted to biological or pharmacological screening is even smaller. Thus, any phytochemical investigation of a given plant will reveal only a very narrow spectrum of its constituents. Historically pharmacological screening of compounds of natural or synthetic origin has been the source of innumerable therapeutic agents. Random screening as tool in discovering new biologically active molecules has been most productive in the area of antibiotics (Gerhartz, Yamamota, Campbell, Pfefferkorn and Rounsaville, 1985; Kroschwitz, and Howe-Grant, 1992). Even now, contrary to common belief drugs from higher plants continue to occupy an important niche in modern medicine. On a global basis, atleast 130 drugs, all single chemical entities extracted from higher plants, or modified further synthetically, are currently in use, though some of them are now being made synthetically for economic reasons (Newman, Cragg and Snader, 2000).

Medicinal plants represent a rich source of anti-microbial agents. Plants are used medicinally in different countries and are a source of many potent and powerful drugs. A wide range of medicinal plant parts is used for extract as raw drugs and they possess varied medicinal properties. The different parts used include root, stem, flower, fruit, twigs exudates and modified plant organs. While some of these
raw drugs are collected in smaller quantities by the local communities and folk healers for local used, many other raw drugs are collected in larger quantities and traded in the market as the raw material for many herbal industries. Although hundreds of plant species have been tested for anti-microbial properties, the vast majority of have not been adequately evaluated (Balandrin, Klocke, Wurtele and Bollinger, 1985). Considering the vast potentiality of plants as sources for anti-microbial drugs, with reference to anti-bacterial and anti-fungal agents, a systematic investigation was undertaken to screen some important medicinal plants commonly used in Unani medicines for anti-bacterial and anti-fungal activity from Lallemantia royleana, Phyllanthus maderaspatensis, Plantago ovata, Rosa indica and Solanum nigrum.

Traditionally, Lallemantia royleana plant is known to be used as curative agent for various ailments like treatment of abscesses, boils and inflammations. The seeds are also known to alleviate fever and common cold, also act as soothing agents for stomach warmness and intestinal troubles. The roots of the plant are known to cure coughing. The seeds are used as an added palatable ingredient in cooling drinks during summers mixed with brown sugar. Often, the plant seeds are used as sedative and considered to be cephalic astringent, cardiac tonic and carminative. (Naghibi et al, 2005).

In the present study anti-bacterial activity of the methanolic extract of seeds of Lallemantia royleana against different Gram-positive and Gram-negative bacteria were evaluated. The crude extract showed good activity with these bacteria when compared with standard antibiotics. Among the tested strains the Gram-positive bacteria were more sensitive to the methanolic extract of Lallemantia royleana. The most promising anti-bacterial activity was seen in the methanolic extracts of Lallemantia royleana against Gram-positive Staphylococcus epidermidis and S.
aureus. Also, strong anti-bacterial activity was noticed in gram-negative bacteria such as *Proteus vulgaris*. The *L. royleana* methanolic seed extract showed maximum inhibition in the growth of bacterial cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 11-17 mm. The *E. coli*, *B. cereus*, *Salmonella typhimurium* the growth of bacterial cells was inhibited when higher concentration of methanolic seed extract of *L. royleana* was used i.e. 200 µg concentrations. Similarly, *Klebsiella pneumoniae* showed resistance against the crude methanolic seed extract of *L. royleana* and the inhibition in the growth of bacterial cells was found when the seed extract was used at a concentration of 500 µg and this inhibition was not significant as compared to *S. epidermis*, *S. aureus*, *P. vulgaris*, *E. coli*, and *B. subtilis* where the inhibition of growth in the bacterial cell was found to be comparable to the standard antibiotic discs used. Therefore the crude methanolic seed extract of *L. royleana* can be used as a potent anti-bacterial agent against bacterial infections.

The anti-fungal activities of the crude methanolic extract of seeds of *Lallemantia royleana* were also evaluated in the present study. It was found to inhibit the maximum growth of *Saccharomyces cervisiae* and *Candida albicans*. The *L. royleana* methanolic seed extract showed maximum inhibition in the growth of fungal cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 4-15 mm. However, the methanolic seed extract of *L. royleana* was least sensitive, where the diameter of the zone of inhibition was less than 5 mm, when used against *Aspergillus niger*. The activities of the methanolic seed extract of *L. royleana* in *A. flavus*, *A. parasiticus* were seen when the crude extract of the seed of *L. royleana* were used at higher concentration i.e. 200 µg. The inhibition of the fungal growth was found to be comparable standard anti-fungal discs used in the present study. Therefore it the crude methanolic seed extract of *L. royleana* can
be used as a potent anti-bacterial agent against human pathogenic infections. Therefore the crude methanolic seed extract of *L. royleana* can be used as a potent anti-fungal agent against fungal infections.

In India *Phyllanthus maderaspatensis* is widely used as an effective hepatoprotective agent in the indigenous systems of medicine and are considered bitter, astringent, stomachic, diuretic, febrifuge, de-obstruent and antiseptic. It is medicinally used to treat headache, bronchitis, ear ache and ophthalmia. The powder from dried plant material mixed with milk is drunk to treat jaundice. The seeds have laxative, carminative and diuretic properties.

1 The *P. maderaspatensis* ethanolic extract is a popular south Indian dietary supplement. It has been studied for its chemoprotective property on adriamycin (ADR)-induced toxicity and oxidative stress in mice (Bommu, *et al* 2007). The plant has been studied for chemoprotective effect in modulating cisplatin-induced nephro-toxicity and geno-toxicity in Swiss albino mice (Chandrasekar, 2006).

In the present study anti-bacterial activity of the methanolic extract of seeds of *Phyllanthus maderaspatensis* against different Gram-positive and Gram-negative bacteria were evaluated. The crude extract showed high sensitivity with these bacteria when compared with standard antibiotics. The most promising anti-bacterial activity was seen in the methanolic extracts of *Phyllanthus maderaspatensis* against Gram-positive *Staphylococcus epidermidis* and *S. aureus* where it shows the maximum diameter of inhibition. Also, strong anti-bacterial activity was noticed with gram-negative bacteria such as *E. coli, Enterobacter aerogenes* and *Proteus vulgaris*. The *P. maderaspatensis* methanolic seed extract showed maximum inhibition in the growth of bacterial cells at 500 µg where the
The diameter of zone of inhibition was found to be ranging from 6-18 mm. The *E. coli*, *Enterobacter aerogenes*, *B. subtilis*, *Pseudomonas aerigiosa*, *Staphylococcus aureus* and *Salmonella typhimurium* the growth of bacterial cells was inhibited when higher concentration of methanolic seed extract of *P. maderaspatensis* was used i.e. 200 µg concentrations. Similarly, the bacterial strains showed resistance against the crude methanolic seed extract of *P. maderaspatensis* and the inhibition in the growth of bacterial cells was found when the seed extract was used at a concentration of 300 µg and this inhibition was not significant as compared to *S. epidermis*, *S. aureus*, *P. vulgaris*, *E. coli*, *Klebsiella pneumoniae* and *B. subtilis* where the inhibition of growth in the bacterial cell was found to be comparable to the standard antibiotic discs used. Therefore the crude methanolic seed extract of *P. maderaspatensis* can be used as a potent anti-bacterial agent against bacterial infections. However, *Psuedomnas aeroginosa* and *Bacillus cereus* was found to be resistant against methanolic seed extract of *P. maderaspatensis*.

The anti-fungal activities of the crude methanolic extract of seeds of *Phyllanthus maderaspatensis* were also evaluated in the present study. It was found to inhibit the maximum growth of *Saccharomyces cervisiae* and *Candida albicans*. The *P. maderaspatensis* methanolic seed extract showed maximum inhibition in the growth of fungal cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 6-17 mm. However, the methanolic seed extract of *P. maderaspatensis* was least sensitive, where the diameter of the zone of inhibition was approximately 6 mm, when used against *Aspergillus niger*. Thus indicating that *A. niger* was resistant to the crude methanolic extract of seed of *P. maderaspatensis*. The activities of the methanolic seed extract of *P. maderaspatensis* in *A. flavus*, *A. parasiticus* were seen when the crude extract of the seed of *P.maderaspatensis* were used at higher concentration i.e. 200 µg. The
inhibition of the fungal growth was found to be comparable standard anti-fungal discs used in the present study. Therefore the crude methanolic seed extract of *Phyllanthus maderaspatensis* can be used as a potent anti-fungal agent against fungal infections.

*Plantago ovata* is commonly known as Psyllium. The husk of the plant is known to be used traditionally as diuretic, emollient and cooling agent. A rapid effect on subjective complaints and objective findings was obtained in 80 per cent of the cases, with good tolerance and no toxic effect on gastrointestinal tract, liver, kidneys, and hemopoiesis (Matev et al 1982). The *in vitro* and *in vivo* studies have been examined for the mechanisms involved in the wound-healing properties of the muco-polysaccharides derived from psyllium husk, assessing fluid absorption, bacterial adherence and *in vitro* stimulatory effects on macrophages. Researchers found that the muco-polysaccharides showed an optimal profile and supported its clinical use in wound healing (Westerhof et al 2001).

The anti-bacterial effect of a soluble pectin polysaccharide (PMII) isolated from the leaves of *Plantago major* was examined in mice infected with *Streptococcus pneumoniae*. The data obtained indicates that PMII protects against pneumococcal infection in mice when administered systemically as a pre-challenge, and its protective effects is due to the stimulation of non-specific mechanisms of defense and not immunity (Hetland et al., 2000). The anti-bacterial effect of ethanolic and methanolic extracts of *Plantago ovata* and *Oliveria decumbens* have been studied as an endemic in Iran against several pathogenic bacteria. The reports showed that the extracts of studied plants had good anti-Staphylococcocal activity (Motamedi, Darabpour, Gholipour and Seyyed Nejad, 2010).
In the present study anti-bacterial activity of the methanolic extract of seeds of *Plantago ovata* against different Gram-positive and Gram-negative bacteria were evaluated. The crude extract showed high sensitivity with these bacteria when compared with standard antibiotics. Both the bacterial strains showed sensitivity against the methanolic seed extract of *Plantago ovata*. *Salmonella typhimurium* and *Escherichia coli* were found to be most sensitive amongst all the test strains. The *P. ovata* methanolic seed extract showed maximum inhibition in the growth of bacterial cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 9-17 mm. The *Salmonella typhimurium, E. coli, P. vulgaris,* and *Staphylococcus aureus* showed the maximum inhibition growth when tested against crude seed extract of *P. ovata*. The growth of bacterial cells was inhibited when higher concentration of methanolic seed extract of *P. ovata* was used at 200 µg concentrations when tested against *Enterobacter aerogenes, B. cereus,* and *B. subtilis*. Similarly, the bacterial strains showed resistance against the crude methanolic seed extract of *P. ovata* and the inhibition in the growth of bacterial cells was found when the seed extract was used at a concentration of 300 µg and this inhibition was not significant as compared to *S. epidermis.* The inhibition of growth in the bacterial cells in most of the bacterial strains was found to be comparable with the standard antibiotic discs used. Therefore the crude methanolic seed extract of *P. ovata* can be used as a potent anti-bacterial agent against bacterial infections. However, *Staphylococcus epidermis* and *Bacillus cereus* was found to be resistant against methanolic seed extract of *P. ovata.* The results given in the present study is the first report which has published showing the anti-bacterial activity of the *P. ovata*.

The anti-fungal activities of the crude methanolic extract of seeds of *Plantago ovata* were also evaluated in the present study. It was found to inhibit the
maximum growth of *Saccharomyces cervisiae*, *Aspergillus flavus* and *Candida albicans*. The *P. ovata* methanolic seed extract showed maximum inhibition in the growth of fungal cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 8-14 mm. However, the methanolic seed extract of *P. ovata* was least sensitive, where the diameter of the zone of inhibition was approximately 6 mm, when used against *Aspergillus parasiticus*. Thus indicating that *A. parasiticus* and *A. niger* was resistant to the crude methanolic extract of seed of *P. ovata*. The activities of the methanolic seed extract of *P. ovata* in *A. flavus*, *A. niger* were seen when the crude extract of the seed of *P. ovata* were used at higher concentration i.e. 200 µg. The inhibition of the fungal growth was found to be comparable with the standard anti-fungal discs used in the present study. Therefore the crude methanolic seed extract of *Plantago ovata* can be used as a potent anti-fungal agent against fungal infections. This is the first result reporting the anti-fungal activity of *Plantago ovata*.

The methanolic extract of *Rosa indica*, along with *Terminalia catappa*, *Terminalia chebula*, *Albizia lebbeck*, *Butea monosperma* had given remarkable bioactivity against Ocular pathogen, *Corynebacterium macginleyi*. (Varaprasad et al., 2010). A study was carried out to evaluate the profile of antibacterial activities in rose petals and it was evaluated that the rose petals of several varieties showed good antibacterial activity against different pathogenic bacteria and was comparable to standard antibiotics (Hirulkar and Agrawal, 2010). The antifungal activity of *Rosa indica* was studied against *Cephalosporium sacchari*, *Curvularia pallascens* and *Fusarium nivale* and promising activity was observed. (Dixit, Tripathi and Upadhyay, 1976).

In this study for the evaluation of the anti-bacterial activity of *Rosa indica* a very promising result was found in that the methanolic extract of petals showed potent
activity. Both the Gram positive and Gram negative bacteria were found to be highly sensitive to the methanolic extracts of petals of *R. indica*. The crude methanolic extract of petal showed high sensitivity with the bacterial strains when compared with standard antibiotics. The *R. indica* methanolic petal extract showed maximum inhibition in the growth of bacterial cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 12-22 mm. The most sensitive bacterial strains against the crude methanolic extract of *R. indica* petals are *Klebsiella pneumoniae*, *Bacillus cereus*, *Salmonella typhinurium* and *Escherichia coli* of all the test strains. In all the bacterial strains used in the present study showed the inhibition of the growth of the bacterial cells even at the lowest concentration tested that is 100 µg. The most sensitive bacteria among all the tested strains were *Klebsiella pneumoniae*. The order of sensitivity of test strains against methanolic extract of petals of *Rosa indica* is *Klebsiella pneumoniae* > *Salmonella typhinurium* > *Staphylococcus epidermidis* > *Pseudomonas aeruginosa* > *Proteus vulgaris* > *Escherichia coli* > *Enterobacter aerogenes* > *Bacillus subtilis* > *Staphylococcus aureus*. The anti-bacterial activity was comparable to the standard commercial antibiotics used in the study. The methanolic extract of petals of *Rosa indica* was found to be more effective than the antibiotic in case of *Klebsiella pneumoniae* and *Bacillus cereus* where the diameter of the zone of inhibition by methanolic extract of petals of *Rosa indica* was found to be much greater than that of the standard antibiotic discs used.

The anti-fungal activities of the crude methanolic extract of petals of *Rosa indica* were also evaluated in the present study. It was found to inhibit the growth of almost all the fungal strains used in the study. The *R. indica* methanolic petal extract showed maximum inhibition in the growth of fungal cells at 300 µg as well as 500 µg concentrations where the diameter of zone of inhibition was found to be
ranging from 12-14 mm. However, the methanolic petal extract of *R. indica* was highly sensitive, with all the fungal strains used in the present study. The inhibition of the fungal growth was found to be comparable with the standard anti-fungal discs used in the present study and in all the strains the diameter of zone of inhibition was much higher. Therefore the crude methanolic petal extract of *R. indica* can be used as a potent anti-fungal agent against fungal infections. This is the first result reporting the anti-fungal activity of *Rosa indica*.

The berries of *Solanum nigrum* (Solanaceae) has been reported in the ancient Indian medicinal literature with beneficial effects in inflammation, tuberculosis, diuretics etc (Chopra, Nayar, Chopra, 1956). Various parts of many of the species belonging to the section *Solanum* are widely used medicinally throughout the world.

In the present study anti-bacterial activity of the methanolic extract of berries of *Solanum nigrum* against different Gram-positive and Gram-negative bacteria were evaluated. Both the Gram positive and Gram negative bacteria were found to be highly sensitive to the methanolic extracts of berries of *S. nigrum*. The crude methanolic extract of berries showed high sensitivity with the bacterial strains when compared with standard antibiotics. The *S. nigrum* methanolic berries extract showed maximum inhibition in the growth of bacterial cells at 500 µg where the diameter of zone of inhibition was found to be ranging from 12-19 mm. The *Salmonella typhimurium, E. coli, Klebsiella pneumoniae*, and *Staphylococcus aureus* showed the maximum inhibition growth in the growth of bacterial cells when tested against crude berries extract of *S. nigrum* in all the concentrations used in the study. The growth of bacterial cells was inhibited when higher concentration of methanolic seed extract of *S. nigrum* was used at 200 µg concentrations when tested against *Klebsiella pneumoniae, B. cereus, Staphylococcus aureus* and *B.*
The inhibition of growth of the bacterial cells in most of the bacterial strains was found to be more than the standard antibiotic discs used. Therefore the crude methanolic berries extract of *S. nigrum* can be used as a potent anti-bacterial agent against bacterial infections. None of the bacterial strains were found to be resistant against methanolic berries extract of *S. nigrum*.

The anti-fungal activities of the crude methanolic extract of berries of *Solanum nigrum* were also evaluated in the present study. It was found to inhibit the growth of almost all the fungal strains used in the study except *Aspergillus parasiticus* which do not show any inhibition even at the highest concentrations tried in the present study. The *S. nigrum* methanolic berries extract showed maximum inhibition in the growth of fungal cells at 300 µg as well as 500 µg concentrations where the diameter of zone of inhibition was found to be ranging from 13-22 mm. However, the methanolic berries extract of *S. nigrum* was highly sensitive, with all the fungal strains used in the present study. The most sensitive fungi among the tested fungal strains was *Aspergillus niger*. *Aspergillus flavus*, *Candida albicans* and *Saccharomyces cervisiae* possessed similar activity and were found highly sensitive to methanolic extract of the berries of *Solanum nigrum*. The inhibition of the fungal growth was found to be much higher as compared with the standard anti-fungal discs used in the present study and in all the strains the diameter of zone of inhibition was much higher. Therefore the crude methanolic berries extract of *S. nigrum* can be used as a potent anti-fungal agent against fungal infections.

Knowledge of the chemical constituents of plants is desirable, not only for the discovery of therapeutic agents, but also because such information may be of value in disclosing new sources of such economic materials as tannins, oils, gums, precursors for the synthesis of complex chemical substances. In addition, the knowledge of the chemical constituents of plants would further be valuable in
discovering the actual value of folkloric remedies (Mojab, Kamalinejad, Ghaderi and Vahidipour, 2003). Chemically constituents may be therapeutically active or inactive. The ones which are active are called active constituents and the inactive ones are called inert chemical constituents (Iyengar, 1995).

The major chemical substances of interest in these surveys were the alkaloids and steroidal sapogenins, however other diverse groups of naturally occurring phytocomponents such as flavonoids, tannins, unsaturated sterols, triterpenoids, essential oils etc., have also been reported (Lozoya et al., 1990). Further phytochemical analysis (Roberts et al., 1981) revealed that the antibacterial activity of methanol extract is due to the presence of phenolic and acidic compounds.

The phytochemicals are as anti-microbial compounds of anti-microbial agents which are found in aromatic and essential oil plants which have made great contribution for quick and effective management of human disease and microbial contamination. Phytochemicals preserved by screening of plant parts e.g. leaves, stems, fruits, etc. There are many solvents in which these phytochemicals gets dissolved and can be useful as human pathogenic. In the present study phytochemical compounds have been evaluated qualitatively and has also been confirmed by thin layered chromatography.

The phytochemical analysis of methanol extract of *Lallemantia royleana* revealed that the anti-bacterial activity is due to the presence of phenolic and acidic compounds. The tests confirmed the presence of alkaloids, anthraquinones, flavonoids, phlobatanins, glycosides, tannins and terpenoids. However, saponins and steroids were absent from the methanolic seed extract of *Lallemantia royleana*. The anti-bacterial and anti-fungal activities are a result of the mechanism of action of these phyto-constituents. The inhibition in the growth of bacteria and fungi is
due to the substrate deprivation, membrane disruption, and formation of cell wall complexes, inactivation of enzymes, metal ion complexation and protein binding. Many plants of the family Lamiaceae exhibit anti-microbial activity, but the plant *Lallemantia royleana* was not studied extensively before (Sarac and Ugur, 2007). The present study for evaluation of anti-bacterial and anti-fungal activity of the plant *Lallemantia royleana* and its methanolic seed extract used in this study has been shown for the first time.

The phytoconstituents were tested qualitatively and estimated quantitatively for the methanolic seed extract of *Phyllanthus maderaspatensis* which contains anthraquinones, flavanoids, phlobatanins, glycosides, saponins, tannins and terpenoids. The anti-bacterial and anti-fungal activity exhibited by the methanolic seed extract of *Phyllanthus maderasptensis* is due to the presence of these phytoconstituents which bind to adhesins and proteins in the bacterial and fungal cells; complex with or inter-calate into their cell wall. The present study for evaluation of anti-bacterial and anti-fungal activity of the plant *Phyllanthus maderaspatensis* and its methanolic seed extract used in this study has not been studied earlier.

The phytoconstituents that were found in the methanolic seed extract of *Plantago ovata* include anthraquinones, alkaloids, flavanoids, phlobatanins, glycosides, saponins, tannins and terpenoids. The anti-bacterial and anti-fungal activity exhibited by the methanolic seed extract of *Plantago ovata* is due to the presence of these phytoconstituents which bind to adhesins and proteins in the bacterial and fungal cells; complex with or inter-calate into their cell wall. These phytochemicals are known to inhibit and inactivates enzymes, cause substrate deprivation and membrane disruption by forming metal ion complexes or by intercalating into cell wall or DNA (Cowan, 1999).
The phytochemical studies of methanolic extract of petals of *Rosa indica* revealed the presence of all the phytochemicals usually present in plants as secondary metabolites. The phytoconstituents present in the methanolic extract of petals of *Rosa indica* confirm the anti-bacterial and anti-fungal activity the petals of the plant. These phytoconstituents act upon the bacterial and fungal strains inhibiting their grown by various mechanisms like binding to adhesins and proteins in the bacterial and fungal cells; complexation with or inter-calation into their cell wall. The phenols are known to cause substrate deprivation and membrane disruption of the pathogenic cells.

The phytochemical studies of methanolic extract of the berries of *Solanum nigrum* revealed the presence of all the phytochemicals usually present in plants as secondary metabolites. The phytoconstituents present in the methanolic extract of the berries of *Solanum nigrum* confirm the anti-bacterial and anti-fungal activity the berries of the plant. These phytoconstituents act upon the bacterial and fungal strains inhibiting their grown by various mechanisms like binding to adhesins and proteins in the bacterial and fungal cells; complexation with or inter-calation into their cell wall. The phenols are known to cause substrate deprivation and membrane disruption of the pathogenic cells. (Cowan, 1999).

The above mentioned plants such as *Lallemantia royleana, Phyllanthus maderaspatensis, Plantago ovata, Rosa indica* and *Solanum nigrum* posses significant anti-bacterial and anti-fungal activities. The plants and its products can be used as potential anti-bacterial and anti-fungal agents against different illnesses caused by the human pathogens. The anti-microbial characteristics of these plants are evidently verified by the presence of phytochemicals which constitutes the major classes of anti-microbial compounds.
Many reports of anti-bacterial activity of plants extract against human pathogens and their pharmaceutical application are available (Cowan, 1999; Cragg et al., 1999; Newman et al., 2000; Gibbons, 2005), but not much has been done on the anti-bacterial activity of plants extract against plant pathogens (Satish et al., 1999). This is mainly due to lack of information on the screening/evaluation of diverse plants for their anti-bacterial potential. Over the last decade, it has become clear that anti-microbial drugs are losing their effectiveness due to the evolution of pathogen resistance. There is therefore a continuing need to search for new antibiotics, especially as new drugs only rarely reach the market. Natural products are both fundamental sources of new chemical diversity and integral components of today's pharmaceutical compendium, and the aim of this review is to explore and highlight the diverse natural products that have potential to lead to more effective and less toxic anti-microbial drugs. It is suggested to carry out the study of efficacy of these plants into animal model and human systems and toxicity studies. Further, the use of the studies plants with anti-microbial properties can serve as a potential candidate that could be successfully exploited for management of the diseases caused by different human pathogenic bacteria and fungi.

The potential for developing anti-microbials from higher plants appears rewarding, as it will lead to the development of a phytomedicine to act against microbes. Plant based anti-microbial represents the vast untapped source for medicine. Plant based anti-microbials have enormous therapeutic potential as they can survive the purpose without any side effects that are often associated with synthetic anti-microbials, continued further research and exploration of plant derived anti-microbials is needed today. Medicinal plants are important source for the development of potential, new chemotherapeutic drugs and the in vitro anti-bacterial test form the basis (Toona, Kambu, Ngimbi, Cimanga, and Vlietinck,
1998, Srivastava, Lambert, and Vietmeyer, 1996). Many of the studies were useful in identifying the active principle responsible for such potentials and to develop clinically important therapeutic drugs for mankind. Hence an attempt has been made to identify the anti-bacterial activity of seeds, petals and berries methanolic extracts of Lallemantia royleana, Phyllanthus maderaspatensis, Plantago ovata, Rosa indica and Solanum nigrum against ten important Gram positive and Gram negative bacteria and five fungal strains. Few studies have showed the anti-viral, anti-bacterial, anti-fungal, anti-helminthic, anti-molluscal, anti-inflammatory, anti-diarrhoeal and insecticidal potential of this traditional medicinal plant (Samy, and Ignacimuthu, 2000, Boonmars, Khunkitti, Sithithaworn, and Fujimaki, 2005, Venkat Rao, Chandra Prakash, and Shanta Kumar, 2006). Previously such studies have been done in several medicinal plants (Senthilkumar, and Reetha, 2009). Previous screening studies by earlier workers proved the anti-bacterial and anti-fungal potential of many medicinal plants.

From the above studies, it is concluded that the traditional plants may represent new sources of anti-microbials with stable, biologically active components that can establish a scientific base for the use of plants in modern medicine. These local ethnomedical preparations and prescriptions of plant sources should be scientifically evaluated and then disseminated properly and the knowledge about the botanical preparation of traditional sources of medicinal plants can be extended for future investigation into the field of pharmacology, phytochemistry, ethnobotany and other biological actions for drug discovery. Since compounds of biological origin are known to posses minimal residual effect. The most active can be subjected to isolation of the therapeutic and out further pharmacological evaluation.
The plant extractive studied could be an answer to the people seeking for better therapeutic agents from natural sources which is believed to be more efficient with little or no side effects when compared to the commonly used synthetic chemotherapeutic agents. The preset study verified the traditional use of *Lallemantia royleana, Phyllanthus maderaspatensis, Plantago ovata, Rosa indica* and *Solanum nigrum* for human ailments and partly explained its use in herbal/unani medicine as rich source of phytochemicals with the presence of tannins, phenols, saponins, steroids, flavinoids and terpenoids.

Considering the rich diversity of plants, it is expected that screening and scientific evaluation of plant extracts for their anti-microbial activity may provide new anti-microbial substances, hence in the present investigation the anti-bacterial and anti-fungal activity of *Lallemantia royleana, Phyllanthus maderaspatensis, Plantago ovata, and Rosa indica* has been demonstrated for the first time against phytopathogenic bacteria. Thus these plants can be utilized as an alternative source of useful drugs. Further studies are needed with these plant to isolate, characterize and elucidate the structure of the bioactive compounds of this plant for industrial drug formulation.