SUMMARY

Plants have been an essential part of human society since the civilization started. They form the basis of traditional medicine systems. The phytochemicals involved in therapeutic purposes are largely the secondary metabolites which are derived biosynthetically from plant primary metabolites. Most of these secondary metabolites employed in modern medicine were first discovered through ethnobotanical investigations. Phytochemical studies of a number of plants have been carried out and active principles are isolated and characterized, which are being used as drugs. But, still there is a vast wealth of medicinal plants that have not been explored and exploited in which they contain bioactive constituents that could be exploited for human welfare. In this context, biological activities of some medicinal plants were screened followed by characterization of the active compounds which are presented in the following chapters.

Chapter 1 deals with the screening of 25 medicinal plants selected based on ethnobotanical data and random selection against several plant and human pathogenic bacteria which were obtained from standard culture centers. Antibacterial activity of aqueous and solvent extracts was performed by agar cup diffusion method. Among the 25 plants, aqueous extract of 3 plants showed activity while, 19 and 18 plants showed, activity against one or the other plant pathogenic and human pathogenic bacteria, respectively. The zone of inhibition against the test bacterial pathogens varied for different solvent extracts. Methanol extract of many of the screened plants recorded good activity followed by ethyl acetate and chloroform extracts indicating the potency of these solvents for extracting the bioactive phytochemicals from the plants.

Chapter 2 presents a detailed study of antibacterial activity of three selected medicinal plants namely, *E. cotinifolia* L., *P. betle* L. (Ambadi var.) and *A. graveolens* L. based on phylogenetic and ethnobotanical approach. Different solvent extracts (petroleum ether, chloroform, ethyl acetate and methanol) of the test plants were subjected to antibacterial activity by agar cup and disc diffusion methods and comparative evaluation was done using standard antibiotics. Methanol and ethyl acetate extracts of *E. cotinifolia* showed a good inhibition zone against both plant and human pathogens. All the solvent extracts of *P. betle* showed activity with varied inhibition zones and among the extracts, methanol extract recorded highest zone of
inhibition (26 to 38 mm). Chloroform and ethyl acetate extracts recorded moderate inhibition zone. *X. vesicatoria* was highly susceptible to the solvent extracts. The zone of inhibition recorded by methanol extract was more than that of the standards streptomycin and R-Bacitracin against all the plant pathogenic bacteria. Methanol extract of *A. graveolens* recorded highest inhibition zone of 12-21 mm. MIC of methanol and ethyl acetate extracts of *E. coticifolia*, chloroform, ethyl acetate and methanol extracts of *P. betle* and methanol extract of *Anethum graveolens* was determined by micro broth dilution method. A significant MIC was observed in methanol, chloroform and ethyl acetate extracts of *P. betle* ranging from 17-416 μg/ml.

**Chapter 3** presents an account of antioxidant evaluation of the selected medicinal plants viz., *E. cotinifolia*, *P. betle* and *A. graveolens* by DPPH radical, hydroxyl radical and nitric oxide scavenging assay. Total phenolic content was determined by a modified Folin-Ciocalteau method. Methanolic extract of *E. cotinifolia*, *P. betle* and *A. graveolens* had highest phenol content. Methanol extract of *E. cotinifolia* recorded good IC\(_{50}\) values. *P. betle* extracts recorded good IC\(_{50}\) of 18-21 μg/ml by DPPH method which was better than the standard AA. Ethyl acetate and methanol extracts of *P. betle* showed potent scavenging ability in all the methods. Similarly, methanol extract of *A. graveolens* recorded good antioxidant capacity in all the methods.

**Chapter 4** deals with the anthelmintic studies of the selected medicinal plants. The assay was performed *in vitro* using adult earthworm (*Pheretima posthuma*) using different concentrations of the extracts (5, 10 and 20 mg/ml) were prepared in DMF. Observations were made for the time taken to set paralysis and death of the individual worms. Anthelmintic activity of all the test plants extracts was in a dose dependent manner with standard piperazine citrate as positive control. Methanol extract recorded least duration of time (11 min and 17 min) for paralysis and death. The ability of different extracts of *A. graveolens* to kill the nematode was in the order methanol (14 min), ethyl acetate (13 min) and chloroform (20 min) extracts. Ethyl acetate and methanol extracts of all the selected plants were found to be potent at the tested dose which is slightly less than the standard drug.

**Chapter 5** describes the phytochemical analysis, isolation and characterization of the active compounds from promising extracts of selected medicinal plants. The methanol extract of *E. cotinifolia* was subjected to column
chromatography and eluted with gradient solvent system of CHCl₃-MeOH to give three fractions ECMF₁, ECMF₂ and ECMF₃. Fraction ECMF₁ was eluted with CHCl₃-MeOH (80:20) to yield compound 1. Fraction ECMF₂ was eluted with CHCl₃-MeOH (50:50) by silica gel column to obtain compound 2. The structure of these compounds were identified by physical and spectroscopic data and IUPAC name is given as 5-hydroxy-4-(2-methoxy-2-oxoethyl)-1,1,7-trimethyl-11-oxo-1a,2,5,5a,6,9,10,10a-octahydro-1H-2,8a-ethanocyclopenta[a]cyclopropa[e][10]annulen-6-yl heptanoate (1) and compound 2 is 5-hydroxy-4-(2-methoxy-2-oxoethyl)-1,1-dimethyl1a,2,5,5a,6,9,10,10a-octahydro-1H2,8methano cyclopenta[a]cyclopropa[e][10] annulen-6-yl hexanoate. The methanol extract of P. betle was subjected to silica gel column and eluted with gradient solvent system of CHCl₃-MeOH to yield three fractions (PBMF₁-PBMF₃). The fraction (PBMF₁) was eluted with CHCl₃-MeOH (80:20) and then subjected to purification by preparative HPLC which resulted into a pure compound. The isolated compound was identified and characterized by ¹H and ¹³C NMR, IR and mass spectra and proposed name of the compound is 4-(2-chloroethyl)naphtho[2,3-d][1,3]dioxole. The active compounds isolated from both the plants recorded good antibacterial activity against the test bacteria. Thus, in the present study two new terpenoids from E. cotinifolia and an aromatic compound from P. betle have been reported with antibacterial activity which could be a source of new active molecules for drug development.

Currently, there is a growing interest of plant based or herbal medicine all over the world. Exploitation of naturally available chemicals from plants, which retards the growth undesirable microorganisms, would be a more realistic and ecologically sound method for plant protection and will have a prominent role in the development of future commercial pesticides. Making drug therapy for various pharmacological activities by natural products being effective, safe and affordable has been the focus of interest in the recent years. A vast wealth of medicinal plants have not been explored and exploited for human welfare. Thus, phytochemicals with various pharmacological properties have to be extensively investigated as a source of multipurpose therapeutic agents and scientific validation of traditional medicinal knowledge can be achieved by biological assay.