Chapter 9

Summary

and

Conclusion
The prime focus of this research work was to establish a standard monograph profile of the tuberous root of *Mirabilis jalapa* and leaf of *Physalis minima* by pharmacognostically, physicochemically, phytochemically and pharmacologically standardize methods. As per literature review both the plants are ethnomedicinally utilized by the people of North East as well as eastern region of India for their primary health care system. So the thought has been made to explore the therapeutic values and development of some novel molecule from those indigenous plants.

**Chapter 1** of this research works deals with the potential of natural sources as medicine for health care system in present world. The term natural products is often used synonymously with secondary metabolite. It is a chemical compound or substance produced by a living organism found in nature that usually has a therapeutic activity and used in drug discovery process. It has been seen that a number of traditionally used natural sources were claimed to improve body immune system and relates diseases caused due to immune disorder such as cardio vascular diseases, cancer, infectious diseases etc. So it can be concluded that the main objective in the development of new molecule should to be safe to use and therapeutically effective along with less or non toxic as a remedy.

**In Chapter 2** have elaborated with the traditional uses, presence of phytocontituents in tuberous root of *Mirabilis jalapa* and leaf of *Physalis minima* along with recent developed technologies involve in isolation of bio-active constituents from natural origin in the form of comprehensive review of literature. Furthermore the current status of natural origin used as immunomodulators, cardioprotective and their screening methods reported in present literature. The review of literature helped to proceed for further investigation towards discovery of new molecule from understudied plant parts.
Chapter 3 accounts with the aim and objective of the present research work are to standardize the understudied medicinal plant parts, isolate the potent compounds and explore the immunostimulatory as well as cardioprotective property of understudied plant parts in the form of extract as well as isolated compound which will be huge input towards the growth and advancement of the phytomedicine era.

In Chapter 4 the overall investigation on different standardization features as per WHO guideline provided support to authenticate, identify and also prevent the possible steps of adulteration of understudied plants. The results obtained from the standardization of tuberous root of *Mirabilis jalapa* and leaf of *Physalis minima* respectively concluded that the presence of foreign substances found within the prescribed limit of WHO, so it signified that the plant is safe for consumption. The modern methodologies for extraction and isolation of bioactive compounds from tuberous root of *Mirabilis jalapa* and leaf of *Physalis minima* along with phytochemical analysis have been presented. The isolated bioactive compound 1 from methanolic extract of tuberous root of *Mirabilis jalapa* was analyzed by using physical spectroscopic methods such as UV, IR, $^1$HNMR, $^{13}$CNMR, Mass and melting point determination etc. The evidence presented conclusively proved that the isolated bioactive compound 1 found was 2-(3’, 4’ dihydroxy phenyl) 3,5,7-trihydroxy Chromen 4-one (Compound 1) from methanolic extracts of *M. jalapa* tuber.

Similarly the isolated bioactive compound 2 from methanolic extract of leaf of *Physalis minima* was analyzed by using physical spectroscopic methods and was found to be 17- (5-Ethyl-6-methylheptan-2-yl) -10, 13-dimethyl -2, 3, 4, 7, 8, 9, 11, 12, 14, 15, 16, 17-dodecahydro -1H – cyclopenta – phenanthren – 3 - ol. The isolations stand a very important
perspective in the present research work because both the isolated phytoconstituents not yet reported from these plants till date.

**In Chapter 5** acute toxicological investigation of methanolic extract of *Mirabilis jalapa* (MEMJ) tuber and methanolic extract of *Physalis minima* (MEPM) leaf were described. The result revealed that the plant extracts were non toxic at doses of 2000 mg/kg as well as 5000 mg/kg bw. So both the drugs can be administered safely in the above mentioned dosage regimen.

**In Chapter 6** the immunostimulatory activity of MEMJ tuber and MEPM leaf and their isolated compounds have been presented. The immunostimulatory potential was investigated by *in vivo* models such as carbon clearance test, humoral antibody titer test, delayed type hypersensitivity test and neutrophil adhesion test in mice. The results revealed that the MEMJ tuber at higher dose (200 and 400 mg/kg b.w) and isolated compounds 1 from MEMJ tuber at the dose 5.56 mg/kg b.w. moderately increased the rate of carbon clearance, humoral antibody titer, percentage neutrophil adhesion and delayed type hypersensitivity in mice.

Similarly MEPM leaf at higher dose (200 and 400 mg/kg b.w) and isolated compounds 2 from MEPM leaf at the dose 6.1 mg/kg b.w. also stimulate the immune responses in mice.

The present study concluded that the immune response was increased in methanolic extract of *Mirabilis jalapa* tuber and isolated compound 1 might be due to flavonoids content in the tuberous part. On the other hand the immune response was increased in methanolic extract of *Physalis minima* leaf and isolated compound 2 might be due to phytosterol content in the leaf part. Therefore the study suggested that the methanolic extract of both
plants are potent immunostimulant on both specific and nonspecific immune mechanisms. So, the methanolic extracts of both plants might be served as potent natural immunostimulatory agent.

In Chapter 7 the cardioprotective activity of MEMJ tuber and MEPM leaf and their isolated compounds have been presented. The present investigation revealed that the administration of MEMJ tuber (200mg/kg bw as well as 400mg/kg bw) and isolated compound 1 (5.56 mg/kg bw) to doxorubicin-intoxicated rats demonstrated prominent reduction in serum biomarker enzymes, normalization of serum lipid profiles compared to doxorubicin control rats in a dose-dependent manner. Also, treatment resulted in significant modulation of lipid peroxidation, endogenous non-enzymatic (GSH) and enzymatic (SOD and CAT) antioxidant and detoxification systems.

Similarly the MEPM leaf (400 mg/kg bw) and its isolated compound 2 (12.2 mg/kg bw) were administered on doxorubicin intoxicated rats and the results were found to be as of MEMJ tuber and isolated compound 1.

Therefore, it can be concluded that the MEMJ and MEPM both are remarkably effective against doxorubicin-induced cardiotoxicity in Wistar rats. Therefore it can be conclude that the cardioprotective property of methanolic extract of Mirabilis jalapa tuber and isolated compound 1 might be due to flavonoids content in the tuberous part on the other hand cardioprotective property methanolic extract of Physalis minima leaf and isolated compound 2 might be due to phytosterol content in the leaf part.

The studies undertaken in this thesis was an attempt towards the search of such lead molecules from the plant drugs, which could contribute a little in the development of some newer molecules, having therapeutic value for the betterment of human society by finding
solutions for some vital clinical conditions and hope it will initiate other researchers to continue the work further to find its potentiality and vitality.