7. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This research work is mainly concentrated to validate the biological activity claimed by several traditional medicinal systems used by the peoples of North-East India. I have concentrated on *Marsilea minuta* and *Phyllanthus acidus* to evaluate their biological activities as they are widely used in several folk medicinal systems. We have also tried to isolate some of the phytoconstituent which may responsible for observed activity.

7.1. SUMMARY

- Based on the literature and preliminary survey we have selected *Marsilea minuta* and *Phyllanthus acidus* to evaluate their biological activity.

- Authentication, collection, extraction, phytochemical evaluation was carried out.

- Antioxidant study of the plants extract, analgesic and anti-inflammatory activity of *P. acidus* and expectorant and antitussive activity of *M. minuta* revealed that methanol extract of both the plant were more effective than ethyl acetate and petroleum ether extract.

- From the observed activity we have decided to continue our study with methanol extract and accordingly we have subfractnated the methanol extract successively with pet ether, ethyl acetate and methanol.

- Methanol fraction of both the plant at a dose of 150 mg/kg showed comparatively better biological activity than other two fractions.

- Methanol fraction of both the plant observed to posses better activity in cisplatin induced nephrotoxicity and paracetamol induced hepatotoxicity.
So we have further tried to isolate phytoconstituent from methanol fraction by column chromatography.

Both fractions also demonstrated significant in vitro and in vivo antioxidant effect.

A saponin from *M. minuta* and a flavonoid from *P. acidus* were isolated which showed potent DPPH and nitric oxide radical scavenging effect.

### 7.2. CONCLUSION

Findings of the present work scientifically established folk medicinal use of *P. acidus* and *M. minuta* used by the people of North East India.

MFM and MFP showed potent hepatoprotective and nephroprotective activity. The fractions also protect vital organs like liver and kidney against oxidative stress evident by the increasing the concentration of endogenous antioxidant level and reducing the concentration of the MDA, a lipid peroxidation index. Thus concurrent use of these fractions or their active chemical constituents may be helpful to prevent the drug induced toxicity in liver and kidney.

Results confirmed potential empirical use of *P. acidus* especially MEP and MFP against acute and chronic pain and inflammation. Inhibitory effect on pain, inflammation mediators and membrane stabilizing effect of extract/fraction may responsible for the observed activity. Therefore the fraction could be further investigated to add in the list of medicinal preparations that may be beneficial in treatment of pain and inflammation.

Extracts (especially MEM) and fractions (especially MFM) found effective as expectorant and antitussive agent. Results indicated that MFM and its active constituents might be beneficial for cough, though further studies may necessary to establish the mechanism(s) of action of the fractions.
Methanol and ethyl acetate fractions of both plants demonstrated moderate anti-TB activity which could pave the way to find a natural antimicrobial agent. Methanol extract of both plants was also exhibited strong antioxidant activity and showed the presence of high concentration of phenolic and flavonoid content, which may be responsible for their observed biological effect. Fraction of these extracts especially MFM and MFP showed very potent antioxidant activity which was comparable or better than the current natural antioxidants like ascorbic acid, rutin and α-Tocopherol. Therefore the inherent free radical scavenging and antioxidant effect of the fractions may be responsible for their beneficial effect in those pathological conditions.

The isolated compounds (a flavonoid from *P. acidus* and a saponin from *M. minuta*) showed potent DPPH and nitric oxide radical scavenging effect; these data suggested the possible use of these compounds for treatment or prevention of oxidative stress related diseases.

### 7.3. RECOMMENDATIONS

- Methanol extract of *P. acidus* and its fractions especially MFP confer potent analgesic and antiinflammatory effect against experimentally induced chronic or acute pain and inflammation. Thus these fractions of *P. acidus* could a lead to find analgesic/antiinflammatory molecule which could replace current synthetic drugs known for their different adverse effects.

- Antitussive and expectorant activity of the extracts and fractions of *M. minuta* leaves (especially MEM, MFM) was evaluated.
An advanced research of these fractions of *M. minuta* can provide the basis for antitussive and expectorant activity of the plant.

- Methanol fraction of *P. acidus* and *M. minuta* showed significant hepatoprotective and nephroprotective effect against paracetamol and cisplatin induced toxicity respectively, which was evident by the restoration of different serum biochemical parameter, increasing the concentration of endogenous antioxidant level and reducing the lipid peroxidation index.

Therefore, highly sophisticated investigation of the fractions of *P. acidus* especially MFP and fractions of *M. minuta* especially MFM in future could be pave the way to find a better hepatoprotective/nephroprotective molecule, concurrent administration of which could helpful to prevent the allopathic drugs induced toxicities.

- Both the plant fraction showed concentration dependent moderate anti-TB activity.

An advanced research of these fractions of *M. minuta* will help to find exact mechanism of action for the observed anti-TB activity. The present study can guide to obtain potent anti-TB drug against different drug resistance pathogenic microbes especially Mycobacteria species.

- A flavonoid was isolated from *P. acidus* and saponin was isolated from *M. minuta*, which showed potent antioxidant activity, therefore further study will help to include these molecules in modern medicine to treat or prevent oxidative stress related diseases.

- Both the plants can be potential source of new and better therapeutic agent. A further investigated will help to discover a suitable molecule or formulation to treat/prevent pain, inflammation, cough, nephrotoxicity, hepatotoxicity and/or tuberculosis.