CHAPTER 7

Summary, Conclusion and Recommendation

7.1 Summary

- The roots of Leucas aspera and Cassia tora were collected from the forest near to vishakapatnam District, (Andhra Pradesh). Powdered plants was extracted with methanolic and petroleum ether using Soxhlet apparatus.

- The Leucas aspera and Cassia tora were subjected to preliminary phytochemical investigations and were found to possess alkaloids, glycosides, carbohydrates, flavonoids, phytosterols/terpenes, proteins, tannins, saponins and lipids.

- The isolated compound from methanolic extract of Leucas aspera (LA-1) is identical with reported Rutin flavonoid and the isolated compound from methanolic extract of Cassia tora (CT-1) is identical with reported Flemingin D flavonoid.

- The Methanol and petroleum ether extracts of Leucas aspera and Cassia tora roots shows significant zone of inhibition against bacteria and fungi. Methanolic extract had produced good antibacterial activity against gram +ve and gram –ve bacteria and fungal strains when compared to petroleum ether extract.

- The pure compounds (LA-1 and CT-1) were tested for minimum inhibitory concentration and all the tested compounds have shown significant activity.
The methanolic and petroleum ether extracts of Leucas aspera and Cassia tora roots (MELA, PELA, MECT and PECT) demonstrated the dose dependent antioxidant activity. The MELA, PELA, MECT and PECT found to possess DPPH radical scavenging, superoxide anion scavenging activities and prevented the depletion of tissue GSH and reduced the lipid peroxidation. Therefore, for further studies MELA, PELA, MECT and PECT are selected for organ protective (hepatoprotective) activity.

Anti-inflammatory activity was evaluated by acute and chronic models of inflammation. For acute anti-inflammatory activity, formalin-induced paw oedema in rats was used. The result of study showed that methanolic and petroleum ether extracts of Leucas aspera and Cassia tora roots has showed significantly acute anti-inflammatory activity. It also showed significantly chronic anti-inflammatory activity.

In this study the MELA, PELA, MECT and PECT extracts of Leucas aspera and Cassia tora roots are evaluated for its analgesic activity by acetic acid induced writhing model in mice. The MELA, PELA, MECT and PECT extracts produced significantly analgesic activity.

Treatments with MELA, PELA, MECT and PECT have protected liver from Paracetamol and thioacetamide induced hepatotoxicity. This was demonstrated by reducing the elevated levels of biochemical markers like SGPT, SGOT, ALP, total protein, total and direct bilirubin, triglycerides (TG), total cholesterol (TC), HDL-
Cholesterol (HDL-C), LDL-Cholesterol (HDL-C), VLDL-Cholesterol (VLDL-C). In addition histopathological observations have shown that there is an improvement in the architecture of liver.

- Overall the root extracts of Leucas aspera and Cassia tora roots are having anti-microbial, in-vitro antioxidant, analgesic, anti-inflammatory and hepatoprotective effect and also antioxidant activity in paracetamol and thioacetamide induced hepatotoxic models.

7.2 Conclusion

- Leucas aspera is a yearly, branched, herb having a height of 15-60 cm with stout and quadrangular stem and branches. Leaves are sub-sessile, linear, obtuse, pubescent up to 8.0 cm long and 1.25 cm broad, with entire or crenate margin. Petiole is 2.5-6 mm long. Flowers are white, sessile small, in dense terminal or axillary whorls. Calyx is variable, tubular and 8-13 mm long. The lower half is usually glabrous and membranous. The upper half is ribbed and hispid. The upper part is produced forward. It is distributed India from the Himalayas down to Ceylon, Philippines, Africa, China, Malaydia, Nepal, Pakistan, Srilanka, Myanmar and Thailand.

- Cassia tora is a wild crop and grown in the majority parts of India as a weed. It is an annual foetide herb, 30-90cm high. Leaves are pinnate, up to 10cm long rachis grooved. Conical gland is present between each of two lowest pairs of leaflet. Leaflets are present in 3
pairs, opposite, abovate, oblong and base ablique. Flowers are in pair which is present in axis of leaves. Petals are five which are in pale yellow colour. Fruit is pod type which is obliquely separate. It is distributed to India, China, Srilanka and South America.

- Preliminary phytochemical studies of all extract revealed that the presence of alkoloids, carbohydrates, flavanoids, glycosides, tannins/phenols, proteins, steroids, saponins, triterpenoids, oils and fats in methanolic and petroleum ether extracts of _Leucas aspera_ and _Cassia tora_.

- The MELA, PELA, MECT and PECT were demonstrated dose dependent manner antibacterial and antifungal activities against one or the other organisms. _Leucas aspera_ and _Cassia tora_ methanolic extract had produced good antibacterial activity against gram +ve and gram –ve bacteria and fungal strains.

- The pure compounds (LA-1 and CT-1) were tested for minimum inhibitory concentration and all the tested compounds have shown significant activity.

- The MELA, PELA, MECT and PECT demonstrated dose dependent manner DPPH radical scavenging assay, superoxide anion scavenging activity.

- The acute toxicity study indicated that the methanolic and petroleum ether extracts of _Leucas aspera_ and _Cassia tora_ (MELA, PELA, MECT and PECT) were devoid of major toxic effects.
The methanolic and petroleum ether extracts of *Leucaea aspera* and *Cassia tora* roots have showed analgesic, anti-inflammatory activity (acute and chronic models).

The MELA, PELA, MECT and PECT demonstrated significant and dose dependent increased in depleted tissue GSH levels by Paracetamol and thioacetamide induced hepatotoxicity and also reduced lipid peroxidation.

The isolated livers from the various toxicant treated (Paracetamol and Thioacetamide) animals exhibited increase in their physical parameters like wet liver weight and wet liver volume. Indeed, extract treated animals exhibited decrease in the values of above physical parameters as an indication of hepatoprotection.

Treatment with MELA, PELA, MECT and PECT brought back the elevated levels of SGPT, SGOT, ALP, total protein, total and direct bilirubin, triglycerides (TG), total cholesterol (TC), HDL-Cholesterol (HDL-C), LDL-Cholesterol (LDL-C), VLDL-Cholesterol (VLDL-C) and ALP in Paracetamol and Thioacetamide induced hepatotoxicity in rats near to health levels. Histopathological observation revealed that treatment with MELA, PELA, MECT and PECT has reversed the hepatic damage by Paracetamol and Thioacetamide. Hence, the *Leucas aspera* and *Cassia tora* possesses hepatoprotective activity.

Overall observed anti- microbial, in-vitro antioxidant, analgesic, anti-inflammatory and hepatoprotective effect may be due to presence of active constituents which are identical with Rutin.
flavonoid and Flemingin D flavonoid present in roots of *Leucas aspera* and *Cassia tora* respectively.

### 7.3 Recommendation

- The present work proposes detailed phytochemical and pharmacological evaluation of *Leucas aspera* and *Cassia tora* by in-vitro and in-vivo studies as given rise to a new dimension in the treatment of hepatic disorders. Further, the work could be extended to evaluate the effectiveness of the marker compounds for the treatment of liver disorders at its cellular level to elucidate its exact mechanism for the traditional claim.