Chapter 7

Summary and Conclusion
The use of plants, plant extracts and plant derived chemicals in the treatment of diseases, in supplementing foods is firmly rooted in the past and still developing. Many drugs used in contemporary medicine have been derived from plants and were originally discovered through the traditional use by indigenous people. This study was focused on the extraction and pharmacological evaluation of methanol extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO). The plant extracts were subjected to anti-diabetic, hepatoprotective, antioxidant, analgesic, anti-inflammatory and antipyretic studies.

In this study, administration of MEAE and MEGO to STZ - induced hyperglycemic rats incontestable distinguished reduction in blood glucose level, standardization of serum biochemical profiles including lipid contents, comparing to STZ control rats. Therefore, it can be concluded that the plant extracts were remarkably effective against STZ - induced diabetes in Wistar rats thereby validating its ethno medicinal usage. From the ascertained oral hypoglycemic activity in STZ - induced diabetic rats, it can be further inferred that MEAE and MEGO will function a motivating candidate in complementary and alternative medicine for the effective management of diabetes. However, the components responsible for the anti - diabetic activity are currently unclear. Therefore, further investigation is needed to isolate and identify the constituents present in the extracts.

Phenolics are one class of naturally occurring bioactive compounds present in many fruits and vegetables with nutraceutical properties. The role of polyphenols in preventing many chronic diseases is well documented. Phenolic compounds are antioxidants known to function as singlet and triplet oxygen quenchers and can also scavenge other free radicals. The antioxidant properties of phenolic compounds have been implicated in suppressing various health related disorders, including, hepatotoxicity, tissue damage, inflammation and oxidative stress related diseases.

*Andrographis echioides* and *Gynocardia odorata*, are important medicinal herbs of the world, has been reported to be a good source of phenolics and antioxidants. Based on the above point the work was initiated to determine the role of methanol extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) in hepatoprotective and antioxidant activities respectively.
Acute toxicity study revealed the non toxic nature of the plant extracts *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO). There was no lethality or toxicity found at any doses selected through the end of the study.

Phytochemical analysis revealed the presence of carbohydrates, saponins, flavanoids and proteins in the plant extracts.

The principle causes of acetaminophen induced hepatic damage are lipid peroxidation and decreased activity of antioxidant enzymes and generation of free radicals. The plant extracts tested for *in vitro* antioxidant activity, the methanol extract *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) exhibited potent antioxidant activity.

All the plant extracts were also subjected to *in vivo* antioxidant and hepatoprotective studies. Intoxication of rats with Acetaminophen significantly increased the level of SGOT, SGPT and ALP. The treatment also reduced the levels of albumin, total protein, SOD and catalase significantly. The treatment with the methanol extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) at 200 and 400 mg/kg body weight showed a significant and dose dependent decrease in the levels of SGOT, SGPT and ALP, and significant increase in the levels of albumin, total protein, SOD and catalase, when compared to acetaminophen treated rats. A significant restoration of the altered biochemical parameters towards the normal was observed. Silymarin, the standard used also showed the similar results.

The histopathological profile of liver of acetaminophen treated rats showed many hepatocytes showing fatty changes with increased inflammatory cell. Hepatocytes showed early degenerative changes. Liver of rats treated with the methanol extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) at 200 mg/kg body weight showed fatty changes in few areas. The treatment at 400 mg/kg body weight of the extracts and silymarin treatment showed normal structure of the liver.

The plant extracts were also evaluated for analgesic, anti - inflammatory and anti pyretic activities. The results conclude that the methanol extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) shows highly significant values respectively.
From the ascertained oral hypoglycemic activity of the plant extracts of *Andrographis echioides* (MEAE) and *Gynocardia odorata* (MEGO) in STZ-induced diabetic rats, it can be further inferred they will function a motivating candidate in complementary and alternative medicine for the effective management of diabetes. In conclusion, the methanol extracts of plant extracts can be suggested to be beneficial for human beings as dietary supplements on basis of their significant antioxidant nature. The use of these extracts as medicinal agents is of importance in the case of oxidative diseases like inflammation and hepatotoxicity.