



*SUMMARY AND CONCLUSION*

---

## 5.0 SUMMARY AND CONCLUSION

A number of medicinal plants are used in traditional system of medicine for management of liver diseases, treatment of thrombosis and clot related diseases. Medicinal plants are nature's priceless gift to human. They have been used all over the world for the treatment and the prevention of various ailments, particularly in developing countries where infectious diseases are endemic and modern health facilities and services are inadequate.

The study has been focused on the **Antioxidant, Hepatoprotective and Thrombolytic effect of *Alternanthera sessilis* (L).R.Br.ex DC**. The fresh leaves of the plants were collected, washed, air dried in room temperature and powdered. The powder was extracted with ethanol in a soxhlet extractor. The extract was concentrated to dryness and used for the determination of antioxidant, hepatoprotective, cytotoxic and thrombolytic effect of the selected plant. Phytochemical analysis was carried out using fresh leaves of *Alternanthera sessilis*. The present investigation was carried out in four different phases.

- ∅ The **first Phase** involves the screening of phytochemical constituents and determination of antioxidant potential of the plant extract.
- ∅ In **Phase II**, hepatoprotective effect of the plant was evaluated using experimental rats. Histopathological examination was carried out to detect the liver damage in experimental rats.
- ∅ Biosafety screening of the plant extract was carried out in **Phase III** by Brine Shrimp Lethality Bioassay.
- ∅ **Phase IV** involves the assessment of thrombolytic activity of the plant using human blood.

Qualitative analysis of the plant sample revealed that phytochemicals namely alkaloids, flavonoids, glycosides, carbohydrates, terpenoids and anthraquinones were found to be present in both aqueous and organic (ethanolic and petroleum ether) extract of *Alternanthera sessilis* whereas saponins, phenols, tannins and steroids were detected only in aqueous and ethanolic extract and not in petroleum ether extract. The presence of major phytochemicals in *Alternanthera sessilis* may be responsible for the observed antioxidant activity suggesting the plant as a good source of antioxidants. The total antioxidant capacity of the plant increased with increase in concentration of the

leaf extract and this might be associated with total phenols and flavonoids present in the leaves which have the ability to scavenge free radicals.

Hepatoprotective effect of the leaf sample was studied against CCl<sub>4</sub> induced liver damage in experimental rats. The liver weight was increased in CCl<sub>4</sub> treated rats. There was a significant reduction in the liver weight after administration of silymarin and ethanolic extract of the plant. Plant extracts reduced the weight of the liver to a greater extent than the drug silymarin. CCl<sub>4</sub> intoxication decreased the levels of total protein and albumin in experimental rats. Treatment with silymarin and different doses of plant extract (200mg/kg and 400mg/kg) improved the content of total protein and albumin. Substantial elevation of serum bilirubin level in CCl<sub>4</sub> treated rats was brought down to normalization by treatment with ethanolic extract of *Alternanthera sessilis*.

The liver injured non treated group showed a significant increase in serum cholesterol, LDL and triglycerides and a significant decrease in HDL when compared to control group. The groups treated with silymarin and *Alternanthera sessilis* leaf extracts showed a significant decrease in serum cholesterol, LDL and triglycerides and significant increase in HDL. A similar trend was observed in lipid profile of liver samples. This finding suggests the hypolipidemic effect of the selected plant. In CCl<sub>4</sub> group hepatocellular damage was indicated by the elevation of liver and serum enzymes namely AST and ALT. The ethanolic extract of *Alternanthera sessilis* exhibited hepatoprotective effect against CCl<sub>4</sub> induced liver damage by normalizing the elevated levels of the above mentioned serum and liver enzymes.

The levels of TBARS in serum and liver tissues of CCl<sub>4</sub> intoxicated rats were significantly elevated when compared to control animals indicating excessive formation of free radicals and activation of lipid peroxidation system resulting in hepatic damage. Significant decline in the level of TBARS after administration of silymarin and ethanolic extract of *Alternanthera sessilis* suggests anti-lipid peroxidative effect of the selected plant. Histopathology of liver sections of control and experimental animals showed that the leaf extract of *Alternanthera sessilis* prevented fatty degenerative changes of hepatocytes and exhibited improved liver histology revealing the hepatoprotective effect of the plant.

Brine Shrimp Lethality Bioassay indicated that the plant *Alternanthera sessilis* has cytotoxic potential which is concentration dependent. This observation suggests that the plant leaves can be regarded as a promising candidate for a plant derived anti-tumor compound. Comparison of clot lysis by positive control (streptokinase) and negative control (ethanol) clearly demonstrates that there was no lysis when the clot was treated with ethanol. Moderate lysis was noticed with the plant extract and percentage of lysis increased with increase in concentration of the plant sample.

Based on the results of the present study it can be suggested that the selected plant *Alternanthera sessilis* as a good source of antioxidants can be utilized for prevention and treatment of diseases caused by oxidative stress. The plant extract has the potential to protect liver from hepatotoxin. It also exhibited considerable thrombolytic effect. Thus the plant *Alternanthera sessilis* can be considered as a safe, cheap and effective alternative chemopreventive agent in the management liver and cardiovascular diseases.

#### **RECOMMENDATIONS FOR FURTHER STUDY**

- ♣ The active principle present in *Alternanthera sessilis* can be isolated and evaluated for hepatoprotective effect.
- ♣ Thrombolytic activity of *Alternanthera sessilis* can be determined using animal model and can be compared with various thrombolytic drugs.
- ♣ The insecticidal and anti-inflammatory effect of *Alternanthera sessilis* can be studied.