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## *Summary and Conclusion*

## 5.0 SUMMARY AND CONCLUSION

Medicinal plants are being used for the development of new drugs or as a phytomedicine for the treatment of diseases. Even the World Health Organization (WHO) supports the use of medicinal plants, provided it is proven to be efficacious, safe, less toxic, available and reliable natural resource. The scientific search for new drugs from natural products remains a serious task for scientists worldwide. It is a fact that a large segment of the population in tropical countries rely on traditional medicines for their health care needs. Over 80% of population in the developing world makes use of medicinal plant extracts to provide good health. Thrombolytic drugs are widely used for the management of cerebral venous sinus thrombosis patients. Several *in vitro* models have been developed to study clot lysis activity of thrombolytic drugs, but all of these have certain limitations.

The present study was carried out to investigate thrombolytic and antioxidant properties in two different varieties of *Piper betle L.* namely Karpoori and Vellaikodi. An *in vitro* thrombolytic method was used to evaluate the thrombolytic activity of the plant extracts using human blood samples from healthy volunteers. The antioxidant potential was established by the analysis of enzymic and non-enzymic antioxidants. Cytotoxicity of the plant samples was screened using brine shrimp nauplii and LC<sub>50</sub> values were determined. Total cholesterol was estimated in serum obtained from blood samples used for clot lysis and a comparison was made between the serum cholesterol level and percent clot lysis in three different groups such as normal persons, diabetic and hypertensive patients. The efficacy of hydroxychavicol was confirmed by *in silico* characterization.

- ❖ The phytochemical analysis of Karpoori and Vellaikodi variety showed the presence of phytoconstituents namely, carbohydrates, amino acids, proteins, phenols, saponin, glycosides, flavonoids, tannins, alkaloids and volatile oil and the absence of steroids in the aqueous extract. In case of ethanolic extract all the above phytochemicals except alkaloids were

present. The quantitative estimation of phytoconstituents such as flavonoids, tannins and protein indicated that the concentration of all the three phytoconstituents was found to be greater in Vellaikodi variety and protein recorded a maximum value.

- ❖ The level of both enzymic and non-enzymic antioxidants was found to be greater in Vellaikodi variety. The total antioxidant capacity of both the Karpoori and Vellaikodi variety showed an increasing trend with increase in concentration and Vellaikodi variety recorded the maximum activity. These findings suggest that of the two different varieties of betel leaves Vellaikodi may be the rich source of antioxidants.
- ❖ Both the varieties of *Piper betle L.* exhibited a proportional increase in clot lysis with increase in concentration and the maximal clot lysis was observed at a concentration of 1000 µg/ml. Comparison of % clot lysis among the three different groups revealed that the percentage clot lysis was found to be greater in diabetic and hypertensive patients than the control group but the hypertensive patients recorded the maximal value. In all the three groups Vellaikodi variety exerted higher % of clot lysis.
- ❖ Total cholesterol was estimated in serum obtained from blood samples used for clot lysis and compared with % lysis of three groups namely control (normal persons), diabetic and hypertensive groups. Correlation analysis revealed that there is positive correlation between serum cholesterol and the % clot lysis of the betle leaves.
- ❖ Cytotoxicity screening by brine shrimp lethality assay indicated that both Karpoori and Vellaikodi varieties of *Piper betle L.* exhibited an LC<sub>50</sub> value of 800µg/ml and 888.90µg/ml respectively. The positive control (potassium dichromate) showed LC<sub>50</sub> value of 23µg/ml. Comparison of % lethality of the plant extracts and the positive control showed that the betle leaves are less toxic.

- ❖ HPTLC analysis was carried out to determine the bioactive compounds present in the sample. The methanolic extracts of *Piper betle L.* was used for the screening of phytoconstituents namely, flavonoids and tannins. The results revealed the presence of considerable amounts of flavonoids and tannins in the betle leaves.
- ❖ *In silico* study was carried out with hydroxychavicol to analyze their efficacy against blood clotting factors in humans. The structure of target proteins namely TF VIIa, VIII and X was retrieved from Protein Data Bank. The characterization of active component was performed by molecular docking and ADME studies. From the study, it was concluded that hydroxychavicol possessed good docking scores and high binding affinity. The bioavailability of the compound was supported by the ADME profile. *In silico* studies revealed strong interaction of hydroxychavicol with the target proteins namely TF VIIa, VIII and X suggesting its vital role in thrombolytic effect.

On the basis of the results obtained in the present study, it can be concluded that the selected plant *Piper betle L.* possess a good thrombolytic, antioxidant and cytotoxic properties. Thus, it can be investigated as possible sources of cardio protective drugs and chemopreventive agents for the treatment of cancer.

#### **Future aspects:**

1. Isolation and characterization of active components that has clot lysis potential in *Piper betle L.*
2. *In vivo* studies can be carried out for thrombolytic activity in *Piper betle L.*
3. Identification and validation of drug targets and drug candidates using *in silico* methods.