



INTRODUCTION

1.0 INTRODUCTION

*In this light, my spirit saw through all things and into all creatures,
and I recognized God in grass and plants*

-Jacob Boehme

Medicinal plants are an important source for the therapeutic remedies of various diseases. In India, from ancient times, different parts of medicinal plants have been used to cure specific diseases. India is known for its rich diversity of medicinal plants and hence called, 'Botanical Garden of the World'. Plants are used medicinally in different countries and are a source of many potent and powerful drugs. The inhabitants of an area utilize plant wealth for medicine, food and many other purposes (Alagesabooopathi, 2011).

Ayurveda an ancient system of Indian medicine has recommended number of drugs from indigenous plant/animal sources for the treatment of several diseases or disorders. Use of plant products, as medicine is inherent in Ayurveda, the ancient Indian system of health care (Chandak *et al.*, 2010). Since time immemorial, mankind has made use of plants in the treatment of various ailments. The Indian Traditional Medicine like Ayurveda, Siddha and Unani are predominantly based on the use of plant materials (Saleem *et al.*, 2010). Plants produce a diverse array of bioactive molecules, making them a rich source of diverse type of medicines. Thus, natural products with pharmacological or biological activities still play a very important role in medicine. In particular, they are important in the treatment of life-threatening conditions (Onocha *et al.*, 2011).

The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed. Plants are like natural laboratories where a great number of chemicals are biosynthesized and in fact they may be considered the most important source of chemical compounds. Primary plant metabolism synthesizes essential compounds, which are present in all plant species. These compounds such as proteins, fats, carbohydrates and phenols etc. are chief components of animal nutrition (Shekhawat and Vijayvergia *et al.*, 2010).

Phytoconstituents confer specific characteristics and properties to plants. Therefore, the analysis of these constituents in plants would help in determining various biological activities of plants (Elango and Jadhav, 2010). Recently, natural phytochemicals have gained a lot of attention as these phytochemicals have shown tremendous advantages in human health. Phytochemicals may act as antioxidant, anti-microbial, enzyme stimulant, hormone analogs and also as novel source of drugs (Wazir *et al.*, 2011).

Antioxidants are compounds that can delay or inhibit the oxidation of lipids or other molecules by inhibiting the initiation or propagation of oxidizing chain reactions (Acharya *et al.*, 2010). Natural antioxidant compounds are present in all parts of all higher plants. They have been found to protect against a variety of disorders, particularly cardiovascular diseases and some types of cancer (Chaiwong and Theppakorn, 2010). In recent years, intensive research on natural antioxidants derived from plants has grown due to their potential health-benefits in the search for replacements of synthetic antioxidants (Phomkaivon and Areekul, 2009). Plants produce secondary metabolites to counteract Reactive Oxygen Species (ROS) (Palash *et al.*, 2010).

Currently available synthetic antioxidants like butylated hydroxy anisole (BHA), butylated hydroxyl toluene (BHT), tertiary butylated hydroquinone and gallic acid esters have been suspected to cause or promote negative health effects. Hence, strong restrictions have been placed on their application and there is a trend to substitute them with naturally occurring antioxidants. Recently there has been an upsurge of interest in therapeutic potentials of medicinal plants as antioxidants in reducing free radical induced tissue injury (Mon *et al.*, 2011).

The medicinal properties of plants have been investigated in the recent scientific developments throughout the world, due to their potent antioxidant activities, no side effects and economic viability (Kowti *et al.*, 2010). As antioxidants have been reported to prevent oxidative damage caused by free radical, it can interfere with the oxidation process by reacting with free radicals, chelating catalytic metals and also by acting as oxygen scavengers (Patel *et al.*, 2010). Plant antioxidants hold much promise as hepatoprotective drugs (Shilova *et al.*, 2008).

The liver is a vital organ of paramount importance involved in the maintenance of metabolic functions and detoxification from the exogenous and endogenous challenges like xenobiotics, drugs, viral infections and chronic alcoholism. During all such exposures to the above mentioned challenges the natural protective mechanisms of the liver are overpowered, the result is hepatic injury. Liver damage is always associated with cellular necrosis, increase in tissue lipid peroxidation and depletion in the tissue GSH levels. In addition serum levels of many biochemical markers like aspartate transaminase, alanine transaminase, alkaline phosphatase, triglycerides, cholesterol and bilirubin are elevated (Ramakrishna *et al.*, 2011).

A slight alteration in hepatic structure and function may result in potential hypertension, ascites and jaundice and increased bleeding and cause multiple metabolic changes affecting other organs as well (Ibrahim *et al.*, 2011). In the absence of reliable liver protective drugs in modern medicine, a large number of medicinal preparations are recommended for the treatment of liver disorders and quite often claimed to offer significant relief. Attempts are being made globally to get scientific evidence for these traditionally reported herbal drugs (Shanmugasundram *et al.*, 2010).

Plants are unique in their ability to produce an extraordinary array of different secondary metabolites. Many of these metabolites have medicinal or toxic attributes (Amoli *et al.*, 2008). Cytotoxicity via the brine shrimp lethality test is studied in order to reveal new anticancer compounds (Peteros and Uy, 2010). Good cytotoxic effects of crude extracts indicate that it can be selected for further cell line assay, because there is a correlation between cytotoxicity against the brine shrimp nauplii using extracts (Ripa *et al.*, 2010).

Thromboembolic disorders, such as myocardial infarction, cerebrovascular thrombosis, pulmonary embolism and venous thrombolism are life-threatening for human being. The imbalance between coagulation and fibrinolytic events results in the formation of thrombus as a blood clot where it partially blocks a vein or artery and also embolus which formed when the clot breaks off and travels through the bloodstream until it becomes lodged in a smaller blood vessel and leads in the blocking of blood supply (Kumar *et al.*, 2011)

In recent years, thrombolytic therapy has revolutionized the treatment of these diverse circulatory disorders such as pulmonary embolism, myocardial infarction, deep vein thrombosis, thrombosis of the eye etc., Therapy in thrombosis has been directed towards interference with coagulation mechanism, activation of fibrinolytic system, interference with platelet aggregation or combination of these. In addition, surgical intervention to prevent embolization or to remove thrombi and restore blood flow is of critical importance (Kunamneni *et al.*, 2008). Thrombolytic drugs play a crucial role in the management of patients with thrombotic and thromboembolic complications during pre-, peri-, and postinterventional cardiologic procedures and acute thrombotic stroke, most often in combination with anticoagulants, antiplatelet agents or mechanical procedures, in order to achieve vascular reperfusion (Iqbal *et al.*, 2002)

Leafy vegetables apart from being a good source of minerals also contain antioxidant vitamins and pigments. They are also known for their therapeutic value (Borah *et al.*, 2011). Green leaves are considered as a main source of vitamins, minerals and fibre for the local consumers. Due to their dietary importance, many scientific studies have been carried out on the nutritive values of green leaves (Gayathri *et al.*, 2006).

Green Leafy Vegetables (GLV) are micronutrient dense nature's gift to mankind that provide more vitamins per mouthful than any other food. They are a rich source of calcium, iron, β -carotene, vitamin C and dietary fiber and many trace minerals. Green Leafy Vegetables (GLV) also contain an immense variety of bioactive non-nutritive health enhancing factors such as antioxidants, phytochemicals, essential fatty acids and dietary fiber (Gupta and Prakash, 2008).

The present study has been designed to evaluate the plant *Alternanthera sessilis* (L.) R.Br. ex DC with the following objectives:

- To screen the selected plant for its phytochemical constituents and antioxidant potential.
- To study the hepatoprotective effect of the plant using experimental rats.
- To assess the biosafety of the plant using brine shrimp lethality bioassay.
- To evaluate the thrombolytic effect of the selected plant in terms of *in vitro* clot lysis method.