1 INTRODUCTION
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Plants fulfill the needs of not only human being but also entire animal kingdom, especially due to the presence of diverse bioactive compounds. Ethnopharmacology is the cross-cultural study of how people derive medicines from plants, animals, fungi or other naturally occurring resources. Up to now, the field has focused mostly on developing drugs, based on the medicinal use of plants by indigenous people. The discovery that indigenous knowledge about medicinal plants may hold clues for curing western diseases has become one of the most widely used arguments for conserving culture and biological diversity (Farnsworth, 1988).

The word Ayurveda has been coined by the conjunction of two Sanskrit words, "Ayur" means life and "Veda" means knowledge. The word together means the knowledge of life or "science of life and longevity". Its roots can be traced back to antique India, around 5,000 years back in history. Different Ayurvedic classics like Susrutha samhita, Charaka samhita and Ashtanga samgraha etc. have described the Dravyaguna properties of medicinal plants. It is estimated that about 20,000 species of plants are used as source of medicines in the third world countries (Pushpangadan, 1999).

India, having two out of the eighteen Biodiversity Hot Spots of the world, is perhaps the largest producer of medicinal herbs in the world. The vast resources of medicinal plants have been extensively used in various traditional systems of medicine like Ayurveda, Siddha, Unani and Amchi. Traditionally each village in Kerala has three or more folk healers and their number is roughly estimated to be about 5,000 (Rajasekharan et al., 2005). The total number of plant species of all groups recorded from India is 43,000 and 3,000 among them are recognized to possess medicinal
properties. According to an all India Ethnobiological Survey carried out by the Ministry of Environment & Forests, Government of India, over 8,000 plants are being used in traditional, folk and herbal medicine systems of India. Ayurveda, the most ancient and widespread system of healthcare in the country, uses about 900 species of plants. Among other systems, Siddha uses 800 species of plants; Unani, 700 species; Amchi or Tibetan system, about 300 species and Modern medicine uses 90 species of plants (Rajasekharan et al., 2005).

Indian subcontinent excels in plant biodiversity having several medicinal properties. It enables traditional healers to develop effective therapies against various ailments. Kerala has a rich tradition in Ayurveda from time immemorial and contributed much to the development of this system of medicine. Apart from trained Ayurvedic doctors from institutions, there are large numbers of registered as well as unregistered medical practitioners in the state. According to reports, there is 7000 A class and 6000 B class medical practitioners in Kerala (Push pangadan et al., 1998).

The anthropologist referred Kerala as a museum of diverse ethnic groups and a variety of traditional systems of medicine. The forests of Western Ghats of Kerala are endowed with a very rich collection of rare medicinal plants, of which many are endemic to the region (Subramanian, 1982). The tribes, living in this region are known to possess great knowledge on the medicinal uses of many of these plants.

The World Health Organization (WHO) projected that 80% of the populations of developing countries rely on traditional medicines, mostly plant drugs, for their primary health care needs. Similar trends were reported from India, where a large population of rural people and tribals rely heavily on the use of traditional plants for physical and psychological health needs. Medicinal plant demand is increasing day
by day in both developing and developed countries because of the recognition of
natural products being non-narcotic, having no side-effects, its affordable price and
the adverse effects of synthetic drugs. Plants have always been a major component of
traditional system of healing in developing countries, which have also been an
integral part of their history and culture. The medicinal properties of many plants are
scientifically proved but still a lot of plants are phytochemically and
pharmacologically unexplored. Some of these plants used only at tribal level are
found to have very good hepatoprotective, antidiabetic, anticancerous, anti-obesity
and anti-venom activity. But scientific validation is needed to establish their
therapeutic efficacy.
A phytotherapeutic approach to modern drug development can provide many
invaluable drugs from traditional medicinal plants. Search for pure phytochemicals
as drugs is time consuming and expensive. Numerous plants and polyherbal
formulations are used for the treatment of liver diseases. However, in most of the
severe cases, the treatments are not satisfactory. Although experimental evaluations
were carried out on a good number of these plants and formulations, the studies were
mostly incomplete and insufficient. The therapeutic values were tested against a few
chemical-induced subclinical levels of liver damages in rodents. Even common
dietary antioxidants can provide such protection from liver damage caused by
oxidative mechanisms of toxic chemicals.
The reasons are many, such as Indian products are not available in standardized form
due to improper identification, harvest and processing, lack of standardization and
quality control checking, research and development of herbal drugs, clinical trials,
etc. In order to promote Indian herbal drugs, there is an urgent need to evaluate the therapeutic potentials of the drugs as per WHO guidelines (WHO, 2000).

Herbal drugs play an important role in health care programmes especially in developing countries. However, obstacle behind the acceptance of alternative medicines in developed countries is the lack of documentation and stringent quality control. So the documentation and standardization of the raw materials used in herbal medicine is very essential for the worldwide acceptance of these systems of medicine. Correct identification and quality assurance of plant material is indispensable to ensure reproducible quality of herbal medicine, which will contribute to its safety and efficacy.

The Western Ghats of south-western India and the highlands of south-western Sri Lanka, together form one of the most densely populated biodiversity hotspots in the world. The Western Ghats alone harbours approximately 5,000 species of vascular plants belonging to nearly 2,200 genera; about 1,700 species (34 percent) are endemic (found nowhere else) [Anonymous, 1998]. In traditional medicine a number of such plants are used, which are very effective, however, the huge block in promoting the use of herbal drugs is the lack of scientific evaluation and standardization. Further, confusion in the identification of medicinal plants and their substitutes, adulteration, lack of valid and reliable scientific information for their therapeutic efficacy are some of the major problems concerned. Standardization of herbal medicines and quality control of the plant raw materials used as phyto-drugs are the most important challenges in bringing any of the acceptances of concerned people. In 1991, WHO has brought out guidelines for the assessment of herbal medicines with the objective of defining basic criteria for the evaluation of quality,
safety and efficacy of phyto-drugs. The assessment includes assessing the crude raw
drugs, preparation, finished product and stability studies and their biological activity.
In Ayurvedic classics, Vagbhata said, ‘there is no plant on earth without a medicinal
value’. The beneficial medicinal effects of phytomedicines typically result from
synergistic actions of secondary products present in the plants (Wink, 1999). Plant
secondary products have a defensive role against pathogen attack, an attractant role
towards pollinators, protective actions to abiotic stresses such as temperature, water
status, light levels, UV exposure and mineral nutrients and its role at cellular level as
plant growth regulators, modulators of gene expression and in signal transduction
have also been shown (Kaufman et al., 1999; Wink, 1999). Interestingly the
endemism is very high in our country and several thousand species of plants are
documented as endemic to India. To protect, enhance and explore our endemic
medicinal plants resources, intensification of modern scientific studies in the field of
ethnopharmacology is indispensable.
For about four thousands of years, the tribal people have been using various
medicinal plants in the treatment of different diseases. After centuries of trial and
error method, they discovered the miraculous healing power of certain plants. From
their observations they formulated some basic concepts of science, which they have
passed on to the future generation. Hence a considerable part of the knowledge of the
primitive men regarding the uses of plants has been transferred to the indigenous
societies, which are the descendants of the primitive human communities. The
documentation of indigenous knowledge on the utilization of local plant resources by
different ethnic groups or communities is one of the main objectives of
ethnobotanical research (Sasi et al., 2011). In Kerala the major tribal communities
are nearly forty in number. Some of them are still nomadic and living in the forests. The major tribes of Kerala are Kani, Kurichiar, Kurumar, Eravallan, Kattunaikkan, Muthuvan etc (Joseph & Antony, 2012).

There is a need to re-emphasize and enhance research in natural products, especially because only a small fraction of plant species have been investigated so far from Chinnar area. The region falls between latitude 10°15’ - 10°21' N and longitude 77°5' - 77°16' E, covers an area of 90.44 sq km. The altitude is 2,372 m (7,782 ft) (Fig. 1). Muthuvans, the major tribes of Chinnar, are using many plants for their health care and day to day ailments, but many of them have not yet been scientifically validated. It is inevitable to identify novel, active chemo types as leads for bioprospecting of traditional herbal resources. Commonly used hepatoprotective plants like Phyllanthus amarus and P. airy-shawii are available in this area and they are familiar with the use of these plants, though the tribes prefer some other plants, which are not commonly used or scientifically validated. The data collected from this area revealed that they are very effective for the treatment of any liver disorders. As far as the available literature is concerned, certain plants are yet to be scientifically validated. It is very important to validate the traditionally used medicinal plants because nowadays there is an increase

**Figure 1.** Locality map of the study area
in demand, use and popularity for traditional medicine throughout the world, therefore documentation and scientific validation of those plants is the need of the hour. In most of the developed and developing countries the incidence of viral hepatitis is more. So investigation for efficient and reliable medicinal plants for liver disease urges priority.

The liver is a large, reddish brown organ with four lobes of unequal size and shape. A human liver normally weighs 1.44-1.66 kg (3.2–3.7 lb) (Cotran et al., 2005). Being a key organ for detoxication and disposition of endogenous substances, it is continuously and widely exposed to xenobiotics, hepatotoxins and chemotherapeutic agents, which lead to impairment of its functions (Preussmann, 1978). During the metabolism, excessive free radicals are generated and they may cause liver damage. Liver diseases are mainly caused by toxic chemicals, excess consumption of alcohol, infections and autoimmune disorders. Most of the hepatotoxic chemicals damage liver cells mainly by inducing lipid peroxidation and other oxidative damages (Chattopadhyay, 2003; Jurczuk et al., 2004; Li & Trush, 1994; Di Luzio et al., 1967). Hepatotoxicity in most cases is due to free radical. Free radicals are fundamental to many biochemical processes and represent an essential part of aerobic life and metabolism (Tiwari, 2001). Reactive oxygen species mediated oxidative damage to macromolecules such as lipids, proteins and DNA has been implicated in the pathogenicity of major diseases like cancer, rheumatoid arthritis, degeneration process of aging, cardiovascular disease etc. Antioxidants have been reported to prevent oxidative damage caused by free radicals by interfering with the oxidation process through radical scavenging and chelating metal ions (Buyukokuroglu, 2001, Lim & Murtijaya, 2007; Scalbert et al., 2005; Gulcin et al., 2009).
Liver disease is a worldwide health problem. Unfortunately, conventional or synthetic drugs used in the treatment of liver diseases are inadequate and sometimes can have serious side effect (Guntupalli et al., 2006). The most common diseases affected by the liver are, Hepatitis, an inflammation of the liver, most commonly caused by a viral infection. There are five main hepatitis viruses, referred to as types A, B, C, D and E (www.who.int). Hepatocellular carcinoma (HCC, also called malignant hepatoma) is the most common type of liver cancer in adults. Most cases of HCC are secondary to either a viral hepatitis infection (hepatitis B or C) or cirrhosis (Kumar et al., 2003). It begins in the hepatocytes, the main type of liver cell. About 4 out of 5 cancers that start in the liver are this type and is responsible for 80 percent of the primary malignant liver tumors observed in adults (WHO, 2003). A glance at worldwide statistics showed, HCC is the fifth most common cancer worldwide (WHO, 2003) and the third most common cause of cancer-related death with a five-year relative survival rate of about seven percent (Llovet et al., 2003). HCC disproportionately affects men, with four times as many men developing HCC as women (who.int) and causes more than 600,000 deaths annually worldwide. In 2002, approximately 626,000 cases of HCC were reported worldwide (15,000 in the United States and 53,600 in Europe), and more than 600,000 people (about 13,000 Americans and 57,000 Europeans) died of HCC (Ferlay et al., 2004). Some risk factors for HCC include, on-going (chronic) infection with hepatitis B virus (HBV) and/or hepatitis C virus (HCV), family history of liver diseases, cirrhosis, long-term exposure to aflatoxins, tobacco use, long-term use of anabolic steroids, in some parts of the world, water contaminated with arsenic (www.cancer.org). Chronic hepatitis B and C are recognized as the major factors worldwide increasing the risk of HCC,
with risk being greater in the presence of coinfection with hepatitis B virus and hepatitis C virus (Benvegnu et al., 1994; Ikeda et al., 1993; Chiaramonte et al., 1999).

In the absence of a reliable liver protective drug in modern medicine, there are a number of medicinal preparations in Ayurveda recommended for the treatment of liver disorders, the medicine Liv.52 is one among them. In view of severe undesirable side effects of synthetic agents, there is growing focus to follow systematic research methodology and to evaluate scientific basis for the traditional herbal medicines that are claimed to possess hepatoprotective activity (Chatterjee, 2000).

Plant drugs are known to play a vital role in the management of liver diseases. There are numerous plants and traditional formulations available for the treatment of liver diseases (Rai, 1994; Schuppan et al., 1999). About 600 commercial herbal formulations with claimed hepatoprotective activity are being sold all over the world. Around 170 phytoconstituents isolated from 110 plants belonging to 55 families have been reported to possess hepatoprotective activity. In India, more than 93 medicinal plants are used in different combinations in the preparations of 40 patented herbal formulations (Sharma et al., 1991). However, only a small proportion of hepatoprotective plants as well as formulations used in traditional medicine are pharmacologically evaluated for their safety and efficacy (Subramonium, 1999). The use of herbal medicines continues to expand rapidly across the world. Many people now take herbal medicines or herbal products for their health care in different national health-care settings. 80% of the rural population in developing countries depends on traditional medicines to meet their primary health care needs (Bannerman
et al., 1983). Authentication and standardization are prerequisite steps while considering source materials for herbal formulation in any system of medicine (Ahmad et al., 2009).

In traditional systems of medicine, the drugs are primarily dispensed as water decoction or ethanolic extract. Fresh plant parts, juice or crude powder are a rarity rather than a rule. Thus medicinal plant parts should be authentic and free from harmful materials like pesticides, heavy metals, microbial or radioactive contamination, etc. (Kamboj, 2000). It is very important that a system of standardization is established for every plant medicine in the market because the scope for variation in different batches of medicine is enormous. World Health Organization (WHO) encourages, recommends and promotes traditional/herbal remedies in national health care programmes because these drugs are easily available at low cost, safe and people have faith in them. The WHO assembly in number of resolutions has emphasized the need to ensure quality control of medicinal plant products by using modern techniques and applying suitable standards (Raina, 2003).

Plants are a rich source of active ingredients for health care products, with many blockbuster drugs being directly or indirectly derived from plants (Newman et al., 2000). However, many high value plant-derived natural products remain undiscovered or unexplored for their pharmacological activity (Raskin et al., 2002).

Due to lack of awareness of a satisfactory remedy for serious liver diseases and increasing doubt on the efficacy and safety of the currently used drugs or herbal formulations, the quest to find effective and safe drugs or herbal medicines for liver disorders continues to be an area of interest. The present study envisage to conduct a survey on the medicinal plants used for the jaundice and liver diseases among the
tribes of Chinnar area and bio-prospect the most potent and unexplored plant from the survey.

**SELECTION OF THE PLANT FOR PRESENT STUDY**

When selecting a plant for the study, four basic methods are usually followed (Suffness & Douros, 1979):

a) Random choice of plant species  
b) Choice based on ethnomedical use  
c) Follow up of existing literature on the use of the species  
d) Chemotaxonomic and pharmacognostic approaches

Comparison of the four methods showed that the choice based on folklore has given about 25% more positive leads than other methods. Based on the second and third approach, selection of the plant has been made in the present work. In the light of above context, *Combretum albidum* G. Don was selected for further scientific study.

Considering the above points, the objectives set forth for the selected plant are:

- Review of Literature for:
  - General aspects of medicinal plants  
  - Reported hepatoprotective activity of medicinal plants  
  - Ethno-Botanical survey of hepatoprotective plants in Chinnar region  
  - More enquiries on selected medicinal plant and their reported activities

- Survey, Collection and Taxonomic studies on selected plant

- Micromorhological study

- Pharmacognostic study

- Physicochemical study

- Phytochemical study
- Anti-oxidant study
- Anti-microbial study
- Cytotoxicity of different plant extracts under *in-vitro* condition
- Hepatoprotective activity of different plant extracts of the selected plant in different cell lines
- Developing a composite botanical, anatomical and phytochemical profile, that can be used as a marker key for quality checking of raw drugs.

The study includes Taxonomical, Pharmacognostical, Phytochemical, Antioxidant, Antimicrobial, Cytotoxic and Pharmacological (Cell lines) screening of useful parts of selected plant. Special emphasis was given to pharmacognostical and chemical finger printing of genuine raw drug and its useful parts using modern analytical techniques like HPTLC, GC/MS and LC/MS for quality standardisation.

It is earnestly anticipated that this will give scientific validation of the selected plant for its botanical and chemical identity and pharmacological efficacy of the drugs used by the tribals of Idukki districts of Kerala, India. It is also expected that through bio-prospecting of the selected plant, the details of the plant species will be scientifically validated for the future benefit of the researchers and herbal industry.