INTRODUCTION

India is one among the most important countries regarding ancient healing traditions. Its rich array of medicinal plants is used both in commerce and by local populations. Unfortunately, only a small percentage of these medicinal plants is cultivated. The rest is often destructively collected from the wild with little attention to conservation. This short-term plant collection strategy possess a serious threat to the viability of already threatened Indian medicinal plant species (Raven, 1998).

The entire plant kingdom consisting of more than two lakh species originated in 17 centers around the world. The Sahyadris or the Western Ghats is a major mountain range of the world that runs for 1,600 km N-S forming what has been called “the girdle of the earth”. In terms of geological age, they are much older than the Himalayas. The range is only next to the Himalayas on the Indian subcontinent and represents the tropical humid area rich in biodiversity. It is a precious gift of the nature – priceless because the well-being of the entire Southern Peninsula hinges on the ecological stability of these mountains. It is notable for its rich biodiversity. The Silent Valley in the Western Ghats preserve the true bio-diversity of the region in Kerala state, India. About 700 species of medicinal herbs are found here and are used in indigenous systems of medicine. Plants like lemon grass, patchouli and the vetiver species have originated in this area. With tropical and deciduous rainforest, grasslands and scrub forests, mountain forests, Western Ghats in india, are consisted one of the richest collections of flora and fauna on this earth planet. (Rojers, 1991).

India is ranked as one of the 17 mega diversity countries in the world (McNeely et al., 1990). Biodiversity hotspots – Earth is biologically richest places with high numbers of species found nowhere else. Hotspots face extreme threats and have already lost, atleast,70% of their original vegetation. Besides, India harbours two of world’s 34 biodiversity hotspots the Western Ghats and Eastern Himalayas (Gadgil, 1996). It is estimated that in India there are about 17,000 species of flowering plants. Of these 5,640 species occur in Tamil Nadu (Nair and Henry, 1983). According to Nayar (1996) 148 genera and 5,725 species of flowering plants are endemic to India. Of these, 60 genera, (49 being monotypic) and 2,015 species are known to be endemic to peninsular India. Of these, 533 species are endemic
species, 230 red-listed species, 1559 species of medicinal plants and 260 species of wild relatives of cultivated plant (Annamalai et al., 2004).

The Nilgiri Biosphere Reserve, a part of Western Ghats, located north of the Palghat Gap (10 45’-12 5’N latitude and 76 10’-77 10’ E longitude), spreads over an area of ca. 5520 km$^2$ encompassing several National parks and sanctuaries for the *in situ* conservation of many valuable bioresources. They however occupy an area of ca.4225 ha only and generally occur as gallery-forests along water courses, varying in width from a few meters to 400 m (Puri et al., 1989). Mostly the Nilgiris and Agasthiamalai hills are the two hotspots of the Western Ghats. In this area nearly 2000 species of higher plants, 84 species of fishes, 92 species of amphibians, 89 species of reptiles, 15 species of birds and 12 species of mammals are endemic to the Western Ghats (Gupta, 1998).

According to the World Health Organization (WHO), it is estimated that 80% of the populations in developing countries rely on traditional medicines for their primary health care (Farnsworth, 1994). Generally, demand for medicinal plant is increasing in both developing and developed countries due to growing recognition of natural products, since these are non-narcotic without any side-effects, easily available at low cost for the poor.

From the time immemorial, people of India have been using thousands of medicinal plants for curing various diseases and about 8000 herbal remedies have been codified in Ayurveda. The earliest mention of the medicinal uses of plants are found in the Vedhas (1500 B.C). The most important of which is the Rigvedha (4500-1500 B.C.), lists 67 plants of therapeutic use with brief reference to the healing properties of plant like Simal (Silk cotton), Palas, Peepal etc. The Yajurvedha lists 81 plants followed by the Atharvavedha which mentions 290 medicinal plants, with details of plant drugs. The Vedhas are followed by Charaka samhita (700 B.C), another early treatise on Ayurvedha which provides a list of 395 plant drugs and their products for use in health. The three great works of Ayurvedha namely Charaka samhita, Sushruta samhita and Ashtanga Hridaya mentioned in them 19000 plant names referring to around 700 distinct species which accounts to 4% of the total number of species in folk use (Kansara,1995)

Indian medicinal plants have made a good contribution to the development of ancient Indian Materia Medica. Ayurveda (the science of life), the Indian system of medicine
is composed of two words, Ayu (Life) and Veda (Science). It utilizes plant, animal and mineral products for preserving and promoting health, and to cure diseases. It is a complete science of life and not merely a treatise on medicines or treatment of disease. All diseases, in Ayurveda, are supposed to be the result of imbalance among three members, i.e., Vata (air), Pitta (bile), and cough (phlegm). The practice of use of herbal drugs in the treatment of various ailments dates to the days of the Rigveda, Bhrigutantra, Asvini Kumarar, Charak Samhita and Sushrutha Samhita and is well documented in Ayurvedic literature (Das et al. 1995). The Ayurveda system practiced in south India is termed as the ‘Siddha’ system of medicine. It relies on more on mineral drugs and has a unique way of processing herbs and minerals. It is supposed to have originated from Lord Shiva. The practitioners of this system were supposed to be didhr (saints).

The WHO has also recognized the importance of herbal cures and has been active in creating guidelines and standards of Botanical medicine. Medicinal plants are traditionally played an important role in the socio-cultural, spiritual and tribal lives of India. India has glorious traditions of codified healthcare system like Ayurveda, Unani and Siddha. These systems function mainly through folk system and classical system. The preventive, corrective and curative approach of health is the basic strength of Indian system of medicines which are mostly plant based and comprise over 8000 medicinal and aromatic plant species. These codified systems have sophisticated theoretical foundation and there are hundreds of medical tests in the form of Nighantus (Lexicons) and texts on Bhaisajya Kalpana (pharmacy) that specifically deal with plants and plant's products. Siddha is one of the oldest systems of medicine in India, it is therapeutic in nature and specialized in pharmacology. The principles of Siddha and doctrines are similar to Ayurveda. The Unani system was introduced by the Arabs and Persians around the eleventh century to India and interacts closely with Ayurveda and other local medical systems (Darshan Shankar et al., 2000).

The medicinal use of plants is of great antiquity, with current records showing that more than 150,000 plant species have been studied for their medicinal properties. Many plants contain therapeutic substances (Surh and Ferguson, 2003) which can be extracted and used in the preparation of medicines, or the plant itself can be used directly as a medication, a practice that is particularly popular in developing countries. However, many plants contain compounds which are known to cause ill-health, are even death, in animals and humans,
there is considerable interest in determining the health risks associated with plants used for medicinal purposes.

Herbs are used as an integral part of healthcare system in India. Besides, these are also used for beautification, preparation of various cosmetics and colours. However, synthetic chemical compounds have replaced Ayurvedic plant products, the quality, safety and efficacy of natural products and these could be found suitable match to health care management system, (Sharma et al., 2003). The sources from ethnic groups on indigenous herbal medicines had always played a vital role in the discovery of novel chemotherapeutic agents form plants (Katewa and Galav, 2005).

Modern Scientific evidences suggest that antioxidants reduce the risk for chronic diseases including cancer and heart disease. Primary sources of naturally occurring antioxidants are whole grains, fruits and vegetables. Plant sourced food antioxidants like vitamin C, vitamin E, carotenes, phenolic acids and phytoestrogens have been recognized as having the potential to reduce disease risk. Most of the antioxidant compounds in a typical diet are derived from plant sources and belong to various classes of compounds with a wide variety of physical and chemical properties. Some compounds, such as gallates, have strong antioxidant activity, while others, such as the mono-phenols are weak antioxidants (Aruna Prakash, 2000).

Generally, effective synthetic antioxidants such as butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), propyl gallate (PG), and tertiary butylhydroquinone (TBHQ) are used to retard lipid oxidation, but the increased demand of the consumer for natural ingredients determined synthetic antioxidants to be replaced by the natural ones. Unfortunately, in the last decades a reduced number of new antioxidant ingredients have been introduced in the market. Literature described some natural free radical scavengers such astocopherols, carotenoids (including β-carotene, lycopene and lutein), polyphenols (including catechins and flavonoids), amino acids, peptides, proteins, urate, and ascorbate that act as singlet oxygen quenchers (Zhao et al., 2004).

The natural antioxidants present in fruits and vegetables protect lipids, proteins and nucleic acids against the oxidative damage initiated by free radicals. They play a major role in curing cancer, heart disease, and vascular and neurodegenerative diseases. The natural
antioxidants abundantly present in blueberries (genus *Vaccinium*), although various types of antioxidants have been found in blue berry fruits, anthocyanins and other polyphenols have received the greatest attention. Epidemiological studies revealed that a few types of cancer are related to dietary habits and that people who consume large amounts of fruits and vegetables have a lower risk of cancer. Fruits of berry species, including blueberries, strawberries, raspberries and cranberries, inhibit multiple stages of carcinogenesis and stimulate the apoptosis of cancer cells (Martineau et al., 2006).

Bilberry has been used as food for centuries, due to its high nutritive value, and today it represents a precious wild delicacy. Recent studies indicated that blue berries are used for treating bladder stones, biliary disorders, scurvy, coughs and lung tuberculosis. More recently, bilberry fruit extracts have been used for the treatment of diarrhea, dysentery, and mouth and throat inflammations (Anonymous, 2001). The berries contain the anthocyanoside flavonoids anthocyanins, (Nakajima, et al., 2004), stilbenoids, resveratrol (Lyons et al., 2003), vitamins, sugars and pectins. The anthocyanins are considered the most important of the pharmacologically active constituents. Phenolic compounds, including anthocyanins, are known as strong antioxidants. While in vitro antioxidant activity of bilberry extracts has been studied in various non-cellular models (Laplaud et al., 1997).

The use of natural products as complementary approaches to existing medications for the treatment of diabetes mellitus is growing in the world and many plant species in different countries are known to have antidiabetic effects (Steinmetz and Potter, 1991). Various members of *Vaccinium* genus are one of the most frequently used natural antidiabetic remedies from plant origin. The plant *V. arctostaphylos* is a resource of traditional Iranian herbal medicine, which is highly recommended for the treatment of diabetes (Kunitake et al., 2006).

Many herbal preparations are being prescribed as anti-inflammatory and analgesic in the traditional literature. The search for new anti-inflammatory and analgesic agents from the huge array of medicinal plant resources is intensifying (Chatterjee and Pal, 1984). Inflammatory diseases are a major cause of morbidity of the working force in the world. Rheumatism is one of the oldest known diseases of the mankind and affects a large number of people in the world. There was no substantial progress was made till the synthesis of
aspirin in 1899 by the German Company Bayer, the hint of which also was obtained from a plant, the Willow bark, *Salix alba* used worldwide in folk medicine for the relief of aches, fever and rheumatic pain. Since then several plant drugs were introduced for anti-inflammatory activity. In India, many Ayurvedic practitioners are using various indigenous plants for the treatment of different types of arthritic conditions. Although the application of these medicaments has a sound tradition and a rational background according to the Indian system of medicine, perhaps it is essential to investigate the rationality of their use in modern scientific terms (Rainsford and Whitehouse, 1980). Some of the important medicinal plants with anti-inflammatory activity are *Berberis aristata*, *Tylophora indica*, *Anacardium occidentale*, *Curcuma longa*, *Azadirachta indica* and *Glycyrrhiza glabra*. Phytoconstituents isolated from these Indian medicinal plants which have shown a significant anti-inflammatory activity (Biren *et al.*, 2007).

Diabetes is one of the most common chronic diseases in the world and affects 5% of the global population. The number of people with diabetes is increasing dramatically due to the population growth, aging, urbanization, increasing prevalence of obesity and physical inactivity that is finally associated with major health and socio-economic problems. International diabetes federation (IDF) report, about 50.8 million people are suffering from diabetes in India and its prevalence is increasing like other developing countries expecting to reach 82.35 million in 2015. Current estimates demonstrate that the world prevalence of diabetes will increase to 7.7% adults by 2030. Between 2010 and 2030, there will be a 69% increase in number of diabetic patients in developing countries and 20% in developed countries (Shaw *et al.*, 2010). Therefore, with regard to the issue of socioeconomic burden of diabetes, discovery of more effective and less side effect therapies are necessary. The most potent hypoglyceamic effects are commonly found in the species of *Trigonella foenum graecum*, *Camellia sinensis*, *Momordica charantia*, *Gymnema sylvestre*, *Aegle marmelos*, *Tinospora crispa*, *Azadirachta indica* and *Polygala senega* (Bnouham *et al.*, 2006).

There are numerous illustrations of plant derived drugs. The isoquinoline alkaloid emetine obtained from the underground part of *Cephaelis ipecacuanha* and related species, has been used for many years as and amoebicidal drug as well as for the treatment of abscesses due to the spread of *Escherichia histolytica* infections. Another important drug of plant origin with a long history of use is quinine. This alkaloid occurs naturally in the bark of
Cinchona tree. Apart from its continued usefulness in the treatment of malaria, it can be also used to relieve nocturnal leg cramps (Iwu et al., 1999).

The genus Vaccinium (Vacciniaceae) consists of about 450 species, around the world as wild. Berries and leaves of Vaccinium L. (Vacciniaceae) have been an important source of food and pharmaceutical ingredients and are considered to have high antioxidant potential. There are numerous products from Vaccinium leaf and fruit extracts utilized as dietary supplements in the world market. Fruit or leaf extracts of Vaccinium spp., particularly of (V. myrtillus) bilberry (Katsube et al., 2003).

Now-a-days medicinal plants are frequently used as an alternative medicine for extraction of active ingredients which are used in the synthesis of different drugs. Like in case of laxatives, blood thinners, antibiotics and antimalarial medications, contain ingredients from plants. Moreover, the active ingredients of taxol, vincristine, and morphine isolated from foxglove, periwinkle, yew, and opium poppy, respectively.

During the last two decades, the pharmaceutical industry has made massive investments on pharmacological, clinical and chemical researches all over the world in an effort to discover more potent plant drugs from plant origin. The Indian Pharmacopoeia (1966) has recognized eighty five drug plants whose ingredients are used in various pharmaceutical preparations. Among the different species of Vaccinium reported in India, Vaccinium leschenaultii wt is considered one of the most important for its medicinal properties. Based on the medicinal properties of Vacciniaceae members, the present study was undertaken on Vaccinium leschenaultii Wt., an endemic medicinal plant from the Nilgiris, the Western Ghats, with the following objectives.

**Phase I: Phytochemical study**

- To evaluate the preliminary phytochemical study of Vaccinium leschenaultii through qualitative, HPTLC and HPLC profiles.

**Phase II: Biological activities**

- To evaluate the antioxidant activity of Vaccinium leschenaultii in different in vitro models.
➢ To evaluate the anti-inflammatory activity on carrageenan induced paw oedema in rats with various extracts of *Vaccinium leschenaultii*.

➢ To evaluate antidiabetic activity of ethanolic extract of *Vaccinium leschenaultii*.

**Phase III: Antimicrobial activity**

➢ To evaluate antimicrobial activity of ethanolic extracts of *Vaccinium leschenaultii*