Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources; many of these isolates were based on the uses of the agents in traditional medicine. This plant-based, traditional medicine system continues to play an essential role in healthcare, about 80% of the world’s inhabitants relying mainly on traditional medicines for their primary healthcare (Bibitha et al. 2002; Maghrani et al. 2005; Nair et al. 2005; Owolabi et al. 2007). WHO estimated that 5.86 billion inhabitants (that is up to 80% of the World population) still rely mainly on traditional remedies such as herbs for their medicines (Kuruvilla, 2002; Tripathi and Tripathi, 2003).

The plant kingdom has long serve as a prolific source of useful drugs, food additives, flavouring agents, colourants, binders and lubricants. As a matter of fact, it has been estimated that about 25% of all prescribed medicines today are substances derived from plants (Gamaniek, 2000). 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 (UNESCO, 1996). Furthermore, an increasing reliance on the use of medicinal plants in the industrialized countries has been treated to the extraction and development of several drugs and chemotherapeutics from these plants as well as traditionally used rural herbal remedies (UNESCO, 1998).

Traditional medicine is an important source of potentially useful new compounds for the development of novel antibacterial agents. According to the reports of many
researchers (WHO, 2001; Cohen, 2002) antibiotic resistance of microbes is a worldwide problem. Traditional plant therapies coupled with dietary measures as prescribed in Ayurvedic and other indigenous system of medication are good supplement for the treatment of diseases nowadays (Eisenberg et al. 1993; Maclenan et al. 1996). The efficacy of plant based drugs used in traditional medicine have been paid great attention because they are cheap and have little side effects (Cowan, 1999; Bibitha et al. 2002; Dharmasiri et al. 2003; Maghrani et al. 2005). The use of medicinal plants as traditional medicines is well known in rural areas of many developing countries. Traditional healers usually are cheaper and sometimes more effective than modern chemical medicine (Sandhu and Heinrich, 2005).

Medicinal plants are often used in order to replace or assist conventional therapies in the treatment of various diseases. Among other factors, the preference for the use of medicinal plants may be related to their availability and low cost. It is known that medicinal plants have a large diversity of secondary metabolites with different biological activities (Farnsworth et al. 1985; Simoes et al. 2003), which justifies the research on pharmacological properties of plant species and their potential uses in drug development.

Despite the preference of pharmaceutical companies for drug development using synthetic routes, in recent decades, a major concern of the market about the therapeutic potential of plants has been observed (Calixto et al. 2000, Koehn. and Carter, 2005) This fact has been proven by the evidence that nowadays about 25% of the prescribed drugs in the world are directly or indirectly obtained from plants. In addition, approximately 49% of the drugs developed between 1981 and 2002 were obtained from natural products, or
similar semisynthetic or synthetic compounds based on natural products (Koehn. and Carter, 2005).

Rich source of medicines in plants produce wide array of bioactive molecules, most of which probably evolved as chemical defence against predation or infection. It is estimated that only one percent of 2, 65,000 flowering plants on earth have been studied exhaustively for their chemical composition and medicinal value (Martins et al. 2001). India is one of the twelve mega diversity countries in the world and has 45,000 plant species including 17,000 flowering plants have been claimed to possess medicinal properties against human diseases. The country has a rich floral diversity (Perumalsamy and Gopalakrishnakone, 2007).

Phytochemistry is a rapidly expanding area with new techniques for the analysis of organic compounds. Phytochemical evaluation is one of the tools for the quality assessment of plants, which includes preliminary phytochemical screening, chemo profiling and marker compound analysis using modern analytical techniques. Medicinal plant research is directed at verifying ethnomedical claims by herbalist with the ultimate aim of isolating active compounds and standardizing the crude extracts used in traditional medicines (Sofowora, 1986; Sofowara, 1993). In order to discover new bioactive compounds, extracts are simultaneously evaluated by chemical screening (Wing, 1999).

Antioxidant compounds in food play an important role as a health protecting factor. Scientific evidence suggests 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, phytate and phytoestrogens have been recognized as
having the potential to reduce disease risk (Schaffer et al. 2007). 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 have strong antioxidant activity, while others are weak antioxidants. The main characteristic of an antioxidant is its ability to trap free radicals. Highly reactive free radicals and oxygen species are present in biological systems from a wide variety of sources. These free radicals may oxidize nucleic acids, proteins, lipids or DNA and can initiate degenerative disease (Yizhong et al. 2004).

Antioxidant compounds like phenolic acids, polyphenols and flavonoids scavenge free radicals such as peroxide, hydroperoxide or lipid peroxyl and thus inhibit the oxidative mechanisms that lead to degenerative diseases (Kumaraswamy and Satish, 2008). There are a number of clinical studies suggesting that the antioxidants in fruits, vegetables, tea and red wine are the main factors for the observed efficacy of these foods in reducing the incidence of chronic diseases including heart disease and some cancers. The free radical scavenging activity of antioxidants in medicinal plants has been substantially investigated nowadays.

Medicinal plants are still a major part of the traditional medical system in developing countries. Several herbal remedies are now being intensively used in therapy. The use of medicinal plants as antiinflammatory and antiarthritic drugs in medicine is a practice common in India, although in most cases the active principles of plants are unknown. However, evaluation of pharmacological effects of the herbal crude extracts can still be used as a logical research strategy in the search of new drugs.
Anticancer

Over the past few decades, cancer has remained as the largest cause of mortality worldwide and the number of individuals living with cancer is steadily expanding. Hence, a major portion of the current pharmacological research is involved with the anticancer drug design customized to fit new molecular targets (Xia et al. 2004). Due to the enormous propensity of plants, which synthesize a variety of structurally diverse bioactive compounds, the plant kingdom is a potential source of chemical constituents with antitumor activities. There are several medicinal plants all over the world, including India, which are being used traditionally for the prevention and treatment of cancer. (Kim et al. 2005; Kintzios, 2006; Indap et al. 2006; Bufalo et al. 2009).

Antidiabetic

Diabetes mellitus is a global health crisis, which has been persistently affecting the humanity, irrespective of the socioeconomic profile and geographic location of the population. Diabetes mellitus has attained a pandemic form. Hence, it is very important to control diabetes and its complications to alleviate the human suffering. Scientists are desperately trying to manage this crippling disorder. Because plants are of enormous medicinal importance, they are being extensively explored for their use against diabetes. Herbal drugs can be quite acceptable as these drugs are known to cause less adverse effects. (Modak et al. 2007). They are quite popular in developing countries. The increased admiration of herbal medicines for diabetes may be due to the side effects associated with the conventional antidiabetic drugs. (Marles and Farnsworth, 1994). The World Health Organization (WHO) has also substantiated the utilization of herbal
remedies for the management of diabetes. (Bailey and Day, 1989). Till date, numerous medicinal plants have been reported to be effective in diabetes, yet plenty of research is still needed to be done.

**Hepatoprotective**

Liver diseases such as jaundice, cirrhosis and fatty liver are common health problems worldwide. Unfortunately, conventional or synthetic drugs used in the treatment of liver diseases are inadequate and sometimes can have serious side effects. (Guntupalli, 2006). 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. 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. (Kanaujia et al. 2011)

**Antifertility**

India within, few years of time span will be the leading country as far as the population growth is concerned. Since the population is rising tremendously, this may affect drastically the economic growth of India. Family planning has been promoted through several methods of contraception, but due to the side effects produced by the use of steroidal contraceptives and use of abortifacient drugs, there is a need of drug which is effective with lesser side effects. (Bingel and Benoit., 1973). Although a wide variety of synthetic contraceptive agents (Benzophenous., 1994) are available, these cannot be used continuously due to their ill effects. Hence people are looking back to age old tradition of
using herbal medicines, which have minimum side effects (Bagul et al. 2005, Chatterjee and Pakrashi, 1995)

**Antiinflammatory**

Inflammation, clinically, causes, rubor, (redness), calor (heat), dolor (pain) of the affected region (Sujith, 2001) and is a complex biological response of vascular tissues to harmful stimuli including pathogens, irritants or damaged cells (Denko, 1992). It is defensive mechanism of the body to remove the injurious stimuli as well as initiate the healing process for the tissue. Inflammation, however, if runs unchecked, leads to onset of diseases such as vasomotor rhinorrhoea, rheumatoid arthritis, and atherosclerosis (Henson and Murphy, 1989). It is believed that current drugs available such as opioids and NSAIDs drugs are not useful in all cases of inflammatory disorders, because of their side effects, economy and potency (Ahmadiani et al. 1998; Gambhire et al. 2009). As a result, a search for other alternatives is necessary. The use of plants to treat ailments is as old as antiquity. Medicinal plants are believed to be an important source of new chemical substances with potential therapeutic effects. (Farnsworth, 1989; Eisner 1990) The research into plants with alleged folkloric use as pain relievers, antiinflammatory agents, should therefore be viewed as a fruitful and logical research strategy in the search for new analgesic and antiinflammatory drugs (Elisabetsky et al. 1995).

The genus *Hugonia* of family Linaceae comprise about 40 species in the world; of which *Hugonia mystax* L. was reported from India. This plant *Hugonia mystax* is locally known as Modirakanni. Ethnobotanically, the fruits are used by the tribals of Kalakad Mundanthurai for the treatment of Rheumatism. Roots were used as anthelmintic,
astringent and also used for dysentery, snake bite, fever, inflammation and rheumatism. Biological activities such as analgesic, antiinflammatory and ulcerogenic were reported.

In view of this fact, in the present investigation, the ethanol extracts of leaf and bark of *Hugonia mystax* L. was used to study the phytochemical and pharmacological assessments viz; anticancer, antidiabetic, hepatoprotective, antifertility and anti inflammatory activities through animal models.

The current investigation was carried out to

1. Study the following pharmacochemical characterization and qualitative organic analysis of leaf and bark of *Hugonia mystax* L.
   a. Ash and extractive values.
   b. Fluorescence analysis.
   c. Preliminary phytochemical screening.
2. Examine the HPTLC profiles of leaf and bark ethanol extracts of *H. mystax* to confirm the presence of alkaloids, flavonoids, glycosides, saponins and steroids.
3. Analyze the GC-MS analysis of leaf and bark ethanol extracts of *H. mystax*.
4. Analyze the LC-MS analysis of leaf and bark of *H. mystax* to identify the compounds and their molecular mass.
5. Assess the *in vitro* antioxidant activity of different solvent extracts of leaf and bark of *H. mystax*.
6. Evaluate the anticancer activity of ethanol extracts of leaf and bark of *H. mystax*.
7. Determine the antidiabetic activity of ethanol extracts of leaf and bark of *H. mystax* in alloxan induced diabetic rats.
8. Assess the hepatoprotective activity of leaf and bark ethanol extracts of *H. mystax* against hepatic toxicity induced by Carbon tetrachloride (CCl₄).

9. Analyze the antifertility activity of the above said plant extracts.

10. Evaluate the antiinflammatory activity of leaf and bark ethanol extracts of *H. mystax* on carrageenan induced oedema in rats.