

1.0 INTRODUCTION

**“There are two ways to live: You can live as if nothing is a miracle;
You can live as if everything is a miracle”.**

The holistic health care system has been practised by people from different ethnic and cultural background worldwide. While these systems in various parts of the world share certain characteristics that distinguish them from biomedicine, approaches to health and healing are diverse and changing overtime (Shahid *et al.*, 2010). Primitive people chiefly depend on plants for their survival. They acquired knowledge of medicinal plants by trial and error methods. Consequently, they became the store-house of knowledge of useful as well as harmful plants, accumulated and enriched through generations and passed on from one generation to another, after refining and additions (Qureshi *et al.*, 2010). The knowledge of medicinal plants has been accumulated in the course of many centuries based on different medicinal systems such as Ayurveda, Unani and Siddha (Muthu *et al.*, 2006).

Traditional medicinal systems of many countries contain rich knowledge on phytomedicines (Joshua *et al.*, 2010). Many traditional healers rely on herbal preparations, often consisting of complex ingredients and with very specific preparations, to treat their patient’s illnesses, rather than just employing single plant extracts. However, studies documenting these preparations and analyzing the composition of mixtures are almost non-existent (Bussmann *et al.*, 2010). The old traditional Indian systems of Medicine (ISM), is one of the most ancient medicine practices known to the world, and derives maximum formulations from plants and plant extracts that exist in the forests (Pala *et al.*, 2010).

Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. The World Health Organization (WHO) has listed 21,000 plants, which are used for medicinal purposes around the world.

Among these, 150 species are used commercially on a fairly large scale (Ahad *et al.*, 2010). India has a rich heritage of traditional knowledge and is home to several important time-honored systems of health care. It has been estimated that the proportion of medicinal plants in India (7,500 of the 17,000 higher plant species are medicinal plants) is higher than any country of the world with respect to the existing flora of that respective country (Brijesh *et al.*, 2009). The world market for herbal remedies was worth 19.4 billion US \$ in 1999. The global demand for medicinal plants is increasing and in India alone, the market is expanding at an annual rate of 20% (Upreti *et al.*, 2010).

Plants play a major role in the treatment of diseases and still remain the foremost alternative for a large majority of people. This knowledge, if wisely utilized, could draw out promising herbal leads (Samuel *et al.*, 2010). Herbs, spices and various plant extracts have received increasing attention as possible Growth Promoters (GP) (Al-Kassi and Witwit, 2010). Herbal medicines can be purchased in bulk in the crude form or as refined pharmaceutical dosage forms such as capsules, tablets, concentrated extracts, tinctures and decoctions. The use of herbal medicines plays significant role in the management of both minor and major illness (Fakeye *et al.*, 2009).

Plant constituents continue to be a vital part of Western medicine, and are still considered an important source of novel compounds in the field of drug discovery (Bhattari *et al.*, 2010). It is estimated that approximately one quarter of prescribed drugs contain plant extracts or active ingredients obtained from or modeled on plant substances (ICMPHD, 2010). The consumption, management and valuation of wild plants are central aspects of the traditional knowledge in many human populations. Thus, plants gathering, the diffusion and conservation of knowledge within the community are traditional practices that have contribution to the subsistence of many cultures (Panghal *et al.*, 2010).

Complementary medicine provides complementary or additional care next to main stream health service (Heiligers *et al.*, 2010). The use of complementary and alternative medicines is burgeoning globally, especially in developed countries (Clement *et al.*, 2007). Considering that eradication therapies can be ineffective and undesirable side effects may occur, the search for new drugs for the development of alternative therapies is very important. Plant extracts are among the attractive sources of new drugs (Bonacorsi *et al.*, 2009).

Plants represent still a large untapped source of structurally novel compounds that might serve as lead for the development of novel drugs. Screening of the plants for their biological activity is done on the basis of either their chemotaxonomic investigations or ethnobotanical knowledge for a particular disease. Identification of a particular compound against a specific disease is a challenging long process. Importance of the plant lies in their biologically active principles (Paschapur *et al.*, 2009).

Recently special attention has been paid towards edible plants, especially those that are rich in secondary metabolites (phytochemicals) and there is now increasing interest in antioxidant activity of such phytochemicals present in the diet. Antioxidants are important in prevention of pollution damage in plants, disease prevention in both plants and animals and play a very important role in the body defense system (Sharique and Seerat, 2009). In nature there are a wide variety of naturally occurring antioxidants which are different in their composition, physical and chemical properties, mechanisms and site of action (Gupta and Sharma, 2006).

A number of known antioxidants as well as yet unknown antioxidants are supposedly present in plants. The presence of phytochemicals has attracted a great deal of attention, concentrated on their role in preventing diseases. Besides natural antioxidants, medicinal plants may also provide fibers and other biotic compounds (Haripyaree *et al.*, 2010). Plants protect cell and subcellular systems from the cytotoxic effects of the active oxygen radicals using antioxidant enzymes

such as superoxide dismutase, ascorbate peroxidase, glutathione reductase, catalase and metabolites like glutathione, ascorbic acid, α -tocopherol and carotenoids (Almeselmani *et al.*, 2006).

Free radicals play important roles in many physiological and pathological conditions. In general, excess of free radicals caused by the imbalance between free radical generation and scavenging may contribute to disease development (Froufe *et al.*, 2009). Over production of such free radicals can cause oxidative damage to biomolecules (e.g. lipids, proteins, DNA), eventually leading to many chronic diseases, such as atherosclerosis, cancer, diabetes, aging and other degenerative diseases in humans (Jain and Agarwal, 2008). These free radicals can be scavenged through chemoprevention by utilizing natural antioxidant compounds present in foods and medicinal plants. Some medicinal plants have been shown to have both chemopreventive and /or therapeutic effects on human diseases (Jaleel *et al.*, 2009).

In the United States, over 1500 people are expected to die of cancer each day, representing an estimated total mortality rate of about 560,000. More than twice as many persons than this will be diagnosed with invasive cancer, but, overall, a slight decline in cancer incidence rates has been observed in USA (Maridass, 2008). Epidemiological, biological and clinical studies have provided various lines of evidences that dietary factors have a profound impact on etiology and prevention of human cancers. Therefore, chemoprevention of cancers by nutraceuticals and phytochemicals has become a flourishing research field in the past decade (Sharififar *et al.*, 2009). The cytotoxic plant samples may have clinical and therapeutic proposition in the most life threatening diseases and further studies are required to investigate these plant samples as antineoplastic agents (Ahsanul *et al.*, 2009).

Cytotoxicity detected by using brine shrimp lethality assay is indicator of wide range of pharmacological activities such as anticancer, antiviral, insecticidal, pesticidal and AIDS (Rakesh *et al.*, 2010). It determines the lethalities of materials toward brine shrimp larvae and in doing so predicts the ability to kill cancer cells (Oladimeji *et al.*, 2006). This assay is very useful for the isolation of biogenic compounds from plant extracts (Manilal *et al.*, 2009). The data of this assay showed strong correlation with costly cytotoxicity tests using human cancer cell lines (Mojica and Micor, 2007). It has been established as safe, practical and economic method for determination of bioactivity of plant products (Amoli *et al.*, 2009).

Natural products offer an untold diversity of chemical structures. These natural compounds often serve as lead molecules whose activities can be enhanced by manipulation through combinations with chemicals and by synthetic chemistry. An important source of natural products is plants which are rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids, and flavonoids and these have been found invitro to have antimicrobial properties. The enhancement of antibiotic activity or the reversal of antibiotic resistance by natural or synthetic non-conventional antibiotics has led to the classification of these compounds as modifiers of antibiotic activity (Darwish and Aburjai, 2010). The frequency of life-threatening infection caused by pathogenic microorganisms has increased worldwide and is becoming an important cause of morbidity and mortality in immuno compromised patients in developing countries. Although huge numbers of antimicrobial agents have been discovered the pathogenic microorganisms are developing resistance against these agents day by day. In recent years, attempts have been made to investigate the indigenous drugs against infectious diseases. Research in the field of indigenous plants is significant aspect of developing a safer antimicrobial principle through isolation, characterization, identification and biological studies (Khan *et al.*, 2007).

The indigenous traditional knowledge of medicinal plants of various ethnic communities, where it has been transmitted orally for centuries is fast disappearing from the face of the earth due to the advent of modern technology and transformation of traditional culture. There is an urgent need to document the ethnobiological information presently existing among the diverse communities before the traditional knowledge are completely lost (Sahu *et al.*, 2010). The lack of attention to the regulation of medicinal plants has occurred for a number of reasons, two of which are that: (i) it is often assumed that these medicinal agents, because they have been used for hundreds or thousands of years, are safe (and thus don't need regulation), (ii) their supply is unlimited (Cordell, 2007).

Biodiversity is a part of our daily lives and livelihoods and constitutes the resources upon which families, communities, nations and future generations depend. So far only about ten per cent of plants have ever been evaluated for their medicinal or agricultural potential and so there are certainly many new drugs and new crops yet to be discovered (Balakrishnan *et al.*, 2009). The increasing demand for medicinal plants has meant that sustainable harvesting is not feasible. In fact, the only real solution is to develop medicinal plants as crops through small-scale farming (Fennell *et al.*, 2004).

With this background the present study has been selected with the following objectives:

- To analyze the phytochemicals of the selected plant *Mukia maderaspatana* (L.).
- To determine the antioxidant potential and free radical scavenging activity of *Mukia maderaspatana* (L.).
- To assess the cytotoxic effect of the plant samples.
- To establish antibacterial activity of the plant extracts.