CHAPTER 1

INTRODUCTION

1. Introduction

Association and dependence of man with or on plants have originated at the very beginning of life as man couldn't think his life without the plants or plant products that provide 'life saving' oxygen, 'energy giving' food, 'life protecting' shelter and 'disease curing' medicine - the basic human necessities for sustaining, maintaining and continuing the life forms on earth. Ever since the birth of mankind there has been a close affinity among man, medicinal plants and medication systems. Over the time span man has acquired knowledge to recognize and categorize the available plants for multifarious uses. The use of medicinal plants can be traced to the earliest of myths, traditions and documentations used to codify these plant materials that could relieve pains and cure diseases. These medicinally valued plants form the core structure of the traditional medicine systems that have been in existence for an age-long and continue to serve humankind with newer remedies and possibilities. The evolution of plant-based system of medication, primarily originated within a local area, and then flourished as popular indigenous systems of medicine such as the Ayurveda, Siddha and Unani of the Indian sub-continent, the Chinese and Tibetan in other parts of Asia, the Native American of North America, the Amazonian of South America, and several unorganized systems of folk-medicine within Africa. Throughout the world, the use of conventional medicine is common but nearly 70-80 % of the primary health care remains based on plants (Mamedov and Craker, 2012).

Food, the most important among the basic ones of life's prerequisite helps to nurture the life in a healthy style. Many of the foods, usually we take in our everyday life as normal diet have been prepared with lots of herbs and spices. With the increasing interest in "functional foods" among researchers and health professionals, herbs and spices have been receiving a thought-provoking attention for their power to confer health benefits beyond basic nutritional assistance. In the modern era of science and technology, the foods or food components, which are a part of an everyday diet and is demonstrated to offer disease-preventive, health-protecting and physiological benefits beyond the widely accepted nutritional effects, are known as "functional foods" (Hasler, 1998; FFC, 2012). Functional foods can prevent or delay the onset of chronic diseases as well as provide basic nutritional requirements (Medoua *et al*., 2009). Functional foods which contain variety of phytochemical constituents can have long-term health promoting or medicinal qualities. Herbs and spices have a long

traditional history of medicinal usages, with significant roles in cultural heritage, and in the appreciation of foodstuff and its link to good health (Krishnaswamy, 2008).

Foods in combination with herbs and spices have pharmacological agents in plenty; they act as drugs in the body system, and depending on the food one eats, effects at the cellular level can be observed. This inspires to investigate a Food-Health-Disease (FHD) connection which has led to the realization of amazing potentials of phytochemicals as because plants are the richest and widest source of bioactive phytoconstituents and antioxidant nutrients (Elless *et al*., 2000). It is now broadly accepted that certain classes of plant-based compounds such as dietary fibers, phenolic acids, flavonoids, vitamins and neuro-pharmacological agents, and antimicrobial compounds play preventive role against the incidence of some common deadly diseases or disorders like diabetes mellitus, cancer, cardiovascular and neurodegenerative disorders, and many infectious microbial diseases of human beings (Fan *et al*., 2007; Siddhuraju *et al*., 2007; Liu *et al*., 2008). A majority of these present day diseases are reported to be due to the shift in the balance of the pro-oxidant and the antioxidant homeostatic phenomenon in the body system. Pro-oxidant conditions dominate either due to the increased generation of the free radicals caused by excessive oxidative stress of the present day life, or due to the poor scavenging in the body caused by depletion of the dietary antioxidants (Schulz *et al.*, 2000; Dringen, 2000). In diet-based health benefits, early investigations confirmed the positive effects of various dietary spices including garlic, ginger, onion and many more.

India possesses a diversity of medicinally important herbs and spice plants and many of them hold good health promoting natural components. The natural components viz. antioxidants, antidiabetics and antimicrobials have the potential ability to decrease blood cholesterol levels and protect against osteoporosis and cancer development, and many emerging infectious diseases of humans. These aforementioned properties of plants, herbs and spices have awarded them to be as nutraceuticals (Wildman, 2001). The culinary application of herbs and spices is the oldest form of aromatherapy used to stimulate gastric secretion and to enhance appetites, create positive moods, perk up the body and organs, relieve from cold symptoms and muscular pains. The active components in herbs and spices are considered as powerful agents to create a state of wellness including production of enzymes that inhibit

cholesterol synthesis, detoxification of carcinogens, lowering the blood pressure, blocking the estrogens and preventing the blood clotting (Uhl, 2000).

In most of the countries of the world, herbs and spices are popular as common food adjuncts which have been used as flavouring, seasoning and colouring agents, and sometimes as food preservatives for thousands of years (Srinivasan, 2005). Beyond their popular house-hold use they are widely admired as traditional medicines (Gao *et al*., 2000; Srinivasan, 2005). Traditional medicines of late have been re-evaluated by the scientists to search a source of "qualified leads" from the bioactive agents for use in the production of next generation drugs. Many of the herbs and spices have been well recognized in traditional medication and possess medicinable bioactive components that conduce beneficial effects on human health through the antioxidant activity, digestive improvement activity, anti-inflammatory, anti-microbial, hypolipidemic activity, antidiabetic activity, anti-carcinogenic activity, etc. (Dorman and Deans, 2000; Pizzale *et al*., 2002; Sokovic *et al*., 2002; Lampe, 2003; Srinivasan, 2005). All these biological activities of herb and spice plants consecutively characterises their medicinal properties.

The increasing demand for herbs and spices that played an important role in world history stimulated by the exploration of the globe and the initiation of trade and cultural interaction between the countries over the world. Focus on herb or spice phytochemicals continues to increase because of their presumably safe nature. Moreover, despite the potentiality of herbs and spices to contribute more than just taste-and-flavour to our food, in many cases dietary recommendations do not yet set for their specific consumption. In recent times the work is only beginning to come forth, providing validation of traditional medicinal practices, and revealing more detailed investigation that must be pursued such as the effective amount of a particular herb or spice that need to be consumed in order to see the long-term health-promoting and health-protective benefits.

Natural antioxidants and antimicrobials present in herb-spice-based foods have gained considerable interest because of their huge commercial applications and therapeutic effects. As most of the synthetic antioxidants do not fall under the status of generally regarded as safe (GRAS), hence they are eliminated from many food applications. The increasing interest in the search for natural replacements for synthetic antioxidants has also led to the evaluation of antioxidant activity of a number of new

plant sources. Nowadays significance of natural antioxidants is increasing with the changes in the pattern of life style, increased intake of artificial additives through processed foods and drinks, stress and strain, air pollution etc. Intake of foods of plant origin with high amount of antioxidants helps to inhibit damages to the cell's macro molecular cascades, and to reduce the risk factor of deadly diseases caused by the free radicals. A variety of antioxidant molecules are present in different parts and tissues of plant. Vitamin A, C and E, and the phenolic compounds are common natural antioxidants present in plant based foods (Javanmardi *et al*., 2003).

Universally herbs and spices are valued as condiments in the national and international cuisine. Beyond that use they have been honoured as basic ingredients of incense, embalming preservatives, perfumes, ointments and cosmetics. Although these are abundantly used in making delicious foods and drinks, the traditional system of medicines to cure both infectious and degenerative diseases is still based solely on some of them. Lack of earlier reports on the diverse medicinal use of dietary herbs and spice plants showing antioxidant, antimicrobial, anti-quorum sensing and antidiabetic activities in both aqueous and solvent systems offered plenty of scope to explore them as new source of pharmacologically active compounds. To evaluate the biological activities of medicinal plant extracts, both *in vitro* and *in vivo* studies are undertaken. Hence the present investigation was carried out based on the following objectives:

- To carry out a survey work, collect and authenticate the commonly consumed dietary herbs and spices and to enlist the medicinally used herbs and spices
- To evaluate qualitative and quantitative phytochemical analysis of the secondary metabolites present in them
- To evaluate the antioxidant activity of selected herbs and spices
- To evaluate the antimicrobial and anti-quorum sensing activities of selected herbs and spices
- To evaluate the antidiabetic activity of selected herb and spice
- To isolate, purify and characterize the bioactive phytocomponent(s) showing biological activities.