1 INTRODUCTION

1.1 Introduction to medicinal plants

"All that mankind needs for health and Healing has been provided
By God in nature, the challenge of science is to find it."¹

“You herbs, born at the birth of time, more ancient than the God themselves
You, who have thousands of powers, free my patient from disease.”

Natural remedies from natural sources like minerals, herbs and animals are the basis for treatment of human diseases in ancient time. In the early era of century, plants were a vital source of raw material of medicine. Greek physician Galen (129-200 AD) describes the basic identical morphological figure of crude drugs and plants which are used as medicine of that time.

Medicinal drug History and their application goes back practically to the existence of humankind. The modern accepted of medicine or synthetic drug has gradually increases over the decades of scientific and observational efforts of scientists however; the basics of its application and development remain in the roots of traditional medicine and therapies. Nevertheless, the ancient wisdom has been the basis of modern medicine and will remain as one important source of future medicine and therapeutics. The future will be more holistic, personal and involve vise use of modern and alternative therapeutic in complementary manner so that community and patients will get maximum benefits.²

1.1.1 Traditional medicine vs. Modern medicine:

The synthetic medicine treats the symptoms and suppresses the disease but does little to ascertain the real cause. Synthetic drugs relieve some molecule and may have harmful side effects. According to late sir William Osler, an eminent physician and surgeon, when they used synthetic drugs, the patient supposed to recover twice; once from illness, and another from the drug, which is used for therapy. Drugs cannot cure the diseases; disease continues. The only pattern of these drugs those changes. They also produce some dietary deficiency by destroying
1. Introduction

nutrients, by preventing their absorption as using them up. The power to restore health thus lies not in synthetic drugs, but present in nature.3

The approach of the recent medicinal system focuses on combative lines after the disease has set in, where as traditional system of medicine lays greater emphasis on preventive method and adopts measures to attain and maintain health and prevent diseases. The recent medicinal system treats each disease as a separate entity, requiring specific medicine for its cure, whereas the traditional system of medicine treats the whole body and seeks to restore harmony of the patients as a whole.4

Botanical compounds are useful not only as drugs or potential medicine in their natural unmodified form, but they are also suitable for intermediate substances for the production of useful synthetic drugs. Diosgenin from Dioscorea species and hecogenine from Agave sisalana, for example, are used as starting materials for the manufacture of oral contraceptives and other steroidal hormones. So many crude drugs are used by tribal community for getting cure from chronic illness.

During the process of searching for lead compounds from botanical sources, either in the form of pure chemical entities or mixture of plant constituents, enormous effort is involved in screening plant extracts for biological activities, bioassay-directed fractionation of the active extracts, as well as isolation and structure elucidation of active ingredients. On the other hand, results obtained from chemical studies of the medicinal plants can enrich our understanding of the natural resources, leading to the discovery of new entities for drug development.5

1.1.2 The herb in Demand:

Herbs are presenting a comeback and herbal ‘renaissance’ is happening and demanding all over the globe. The herbal or natural products today typify safety as compare to the synthetics; as they are regarded as unsafe to humankind and environment. Although medicinal, flavouring and aromatic qualities of herbals had been prized from centuries, the synthetic medicinal products of the modern age exceeded their importance, for a while. However, for safety and security people are returning to the naturals with hope as blind dependence on synthetics is over.6
1. Introduction

World Health Organization (WHO) estimated that 80% of populations of developing nations are still rely on traditional or folk medicines, mostly from plant origin, for their primary need of health care. In some countries, herbal medicines are still a central part of the medical system, such as Ayurvedic medicines in India and traditional Chinese medicine in China. Herbal medicine has a long history and tradition in Europe. Also in modern pharmacopoeia contains at least 20% drugs derived from plants and natural sources. Many other are synthetic analogues built on prototype compounds isolated from plants.  

India recognizes more than 2500 plant species as having medicinal value, Sri Lanka about 1400 and Nepal around 700. During the past decade, a dramatic increase in exports of medicinal plants attests to worldwide interest in their products as well as in traditional health system. International market of crude medicine from plants is over US $ 80 billion per year, which is growing at the rate of 8% and expected to be US $ 5 trillion by 2035.  

A major drawback of traditional medicine is the lack of drug standardization, quality control and information. Most of the Ayurvedic or traditional medicines are in the form of crude formulation or extracts which is a mixture of several components and the active constituents when isolated separately fail to give desired effect. This involves that the activity of the extract is the synergistic effect of its deferent phytoconstituents. Modern methods were involving in different process of formulation the natural product. In the isolation of active constituents and their development into new therapeutics; the methodology for Ayurvedic medical practice requires an integrated rationale approach for the research. Standardization and validation of natural medicines and other related aspects need to be focused upon. In India plenty of plants are used for their medicinal properties. In fact till the date only few plant species has been investigated thoroughly while a great number of plants being extensively used in medicines are still not scientifically investigated. Resurgence in the use of herbal medicines worldwide has provided an excellent opportunity to us to look for therapeutic leads from our ancient system of Ayurveda that could be utilized for drug development. Therefore, there is an urgent need to evaluate the therapeutic potential of the crude drugs as per
1. Introduction

WHO guidelines. The importance of adequate Pharmacognostical, Phytochemical and Pharmacological evidence of natural crude drug used in various medicinal systems is becoming increasingly recognized and in this respect the present work will be useful.9

The south Gujarat region, dense dang forest is estimated to contain 10,000 species of plants, of which more than 1,000 have medicinal values.10 However, little information has been obtained from these medicinal plants, which represent a potential source of lead compounds of novel chemical structure. In the present study, Indian medicinal plants *Heteropharagma adenophyllum* were investigated for its chemical composition. The project includes extraction of plant material, separation and purification of natural products, structural characterization of isolated compound and pharmacological investigation of extract.

1.1.3 Cardiovascular system

Cardiovascular disease (CVD) is responsible for one third of global deaths and is leading and increasing contributor to the global disease burden. Importantly CVD is eminently preventable. Hypertension is already a highly prevalent cardiovascular risk factor worldwide because of increasing longevity and prevalence of contributing factors such as obesity and life style. CVD can be defined as persistently elevated arterial blood pressure. Although elevated Blood pressure (BP) was perceived to be “essential” for adequate perfusion of essential organs during the early and middle 1900s, obesity is now identified as one of the most significant risk factors for cardiovascular disease. Increasing awareness, diagnosis of hypertension, and improving control of BP with appropriate treatment, are considered critical public health initiatives to reduce cardiovascular morbidity and mortality.11

Global Burden of Disease Study reported that in 1990, there were 5.2 million deaths from cardiovascular diseases in economically developed countries and 9.1 million deaths from the same causes in developing countries. The situation in India is more alarming. Data suggest that in the year 2010, 48.8 % people were found hypertensive in India.12 Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary heart disease deaths in India. Indian urban population studies in the mid-1950s used older WHO guidelines for diagnosis (BP
1. Introduction

≥160 and/or 95mmHg) and reported hypertension prevalence of 1.2–4.0%. Hypertensive crises are clinical situations where BP values are very elevated, typically greater than 180/120 mmHg. They are categorized as either a hypertensive emergency or hypertensive urgency. Hypertensive emergencies are extreme elevations in BP that are accompanied by acute or progressing target-organ damage. Hypertensive urgencies are high elevations in BP without acute or progressing target-organ injury.\(^\text{13}\)

It is probable that none of these factors is solely responsible for essential hypertension; however, most anti-hypertensive specifically target these mechanisms and components of the RAAS.\(^\text{12}\) High blood pressure can lead to hypertension complication in other parts of the body because of the damage to the blood vessels and excessive pressure on the artery walls can damage vital organs. The higher the blood pressure and the longer it goes uncontrolled, the greater the damage. Uncontrolled high blood pressure can due to hypertension complication includes – heart attack, Stroke, Kidney failure, Loss of version, Sexual dysfunction, Angina, coronary artery disease, diabetes mellitus etc. The pharmacotherapy of hypertension comprises nine classes of medications: diuretics, aldosterone receptor blockers, β-blockers, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II antagonists, calcium channel blockers, α₁-blockers, central α₂ agonists and other centrally acting drugs, and direct vasodilators. Therapy selection should be tailored to the patient, taking into consideration such issues as safety, cost, adverse event profile, and presence of compelling indications for certain drug classes and risk factors for CVD, as well as clinical evidence of decreased morbidity and mortality secondary to their use. Systolic blood pressure (SBP) is now the recommended treatment focus for most patients, as it have been stated that if SBP is controlled, diastolic blood pressure (DBP) will usually be controlled as well. Recently, National authority for hypertension education also emphasizes this recommendation. The Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-VII) guidelines also recommend that the thiazide diuretics as a choice of first-line therapy in CVD patients with uncomplicated hypertension and as the choice of second agent to be added to other classes used for obligating
1. Introduction

indications if further BP reduction is required. Multiple clinical trials has suggested that two out of every three patients will require at least two medications to lower their BP below 140/90 mmHg. Therefore, the choice of selecting initial less significant therapy for antihypertensive treatment for patients whose BP is more than 20/10 mm Hg above their goal, JNC-VII now recommends that therapy be initiated with two agents.

Although many drugs are available in allopathic medicine to treat hypertension, they produce various systemic side effects or exhibit tolerance upon chronic use. In Ayurvedic medicine, many plant products have been claimed to be free from side effects and less toxic than synthetic drugs.

A number of herbal treatments work effective as an alternative treatment for hypertension. In recent years, the interest in alternative treatments for hypertension has increased and studies have been conducted to discover more natural or holistic treatment options. The push for more natural approaches for the treatment of hypertension may be especially beneficial for patients that have severe side effects with other medications, or groups that are at risk for severe and possibly life threatening side effects or drug interactions, such as children and adolescents, patients already on multiple medications, or the elderly. There are foods that lower blood pressure naturally. Fruits for example contain antioxidants, essential nutrients and vitamins. Some fruits because of their low sodium and potassium content can help lower blood pressure like melon, prunes and bananas. Citrus fruits also can lower blood pressure because of their bioflavonoid content.¹⁴