

## INTRODUCTION

India has a rich heritage of natural products, particularly medicinal plants. These medicinal plants are distributed across different bio-geographic zones, forest types, altitudinal gradations, soil types and rainfall regimes. These plants occur in different life forms ranging from prostrate herbs to lofty trees (Ravikumar *et. al.*, 2009).

Our country is one of the leading bio-diversity centre with 47,513 different plant species of which 18,043 angiosperms, 74 gymnosperms, 2,523 bryophytes, 1,267 pteridophytes, 14,883 fungi, 7,284 algae and 2,401 lichens have been reported (Arisdason and Lakshminarasimhan, 2015). It has been estimated that at present the flowering plants of India constitute 251 families, 2991 genera, 17,527 species, 269 sub-species, 2251 varieties, 33 sub-varieties and 70 forms (Karthikeyan, 2009). About 5,000 flowering plant species have been recorded in different codified and non-codified system of medicine practiced by 4,635 ethnic communities. Singh *et. al.* (2001) has reported that about 7,000 angiosperm species are used for various medicinal purposes. However All India Coordinated Research Project on Ethno-botany (AICRPE) sponsored by Ministry of Environment & Forest, New Delhi has reported 8,000 plant species that are medicinally used by different ethnic communities across the country (Ravikumar *et. al.*, 2009).

In fact, WHO has listed over 21,000 plant species used for various medicinal uses around the world. More than 60% of the World's human population relies on plant medicine for primary health-care needs (Singh *et. al.*,

2002). India is endowed with rich wealth of medicinal plants which are widely used by all sections of people either directly as folk remedies or different indigenous system of medicine or indirectly in the pharmaceutical preparations of modern medicines (Alagesaboopathy, 2011). There is also a great scope for converting low priced crude drugs to highly valued phyto-chemicals and thus earn more foreign exchange. A list of 960 medicinal plant species forming source of 1289 botanical raw drugs in trade in the country has been worked out from the literature and data collected during the study on (i) consumption of botanicals by the herbal manufacturing units and (ii) the plant raw drugs traded in the Mandis (raw drug trading centres) (Ved and Goraya, 2007; Abdul Kader, 2014). Modern pharmacopoeias contain at least 25% of drugs derived from plants and many others, which are synthetic analogue, built on prototype compounds isolated from plants.

According to literature the utilization of medicinal plants in India is voluminous (Nadkarni, 1976; Kritikar and Basu, 1998; The Wealth of India, 1948-1976). Indian Materia Medica includes about 2000 drugs of natural origin almost all of which are derived from different traditional system of medicines (Narayana *et. al.*, 1998). Out of these drugs about 400 are of mineral and animal origin and the rest are from plant origin.

Today, India is one of the major exporters of raw medicinal plants and processed plant-based drugs (Singh *et. al.*, 2002). Exports of the medicinal plants and their products were valued at US \$67 million during the year 2000 (Kumar, 2004).

Plant species still serves as rich source of many novel biological active compounds and very few plant species have been thoroughly investigated for their medicinal properties (Agarwal *et. al.*, 2002).

Ultimately plant constituents may be isolated and used directly as therapeutic agents or a starting material for drug synthesis or they may serve as models for pharmacologically active compounds in drug synthesis like digitoxin, morphine, atropine, coumarin and colchicine (Hansel, 1972).

### **Traditional Medicine:**

The indigenous system of traditional healing is very popular in Asian Countries such as China, Japan, Nepal, India, Sri Lanka etc., and it has a long history. It is a well-known fact that Traditional System of Medicine always played an important role in meeting the global health care needs. Several countries like France, Germany, UK, USA, Canada, Chile, Japan, Korea, China, Saudi Arabia, South Africa, Australia and New Zealand are also practising their own traditional system for the benefit of the mankind (WHO, 2002).

The World Health Organization (WHO) defined traditional medicine as “the sum total of all the knowledge and practices, whether explicable or not, used in diagnosis, prevention and elimination of physical, mental or social imbalance and relying exclusively on practical experience and observation handed down from generation to generation, whether verbally or in writing” (WHO, 1978). Traditional medicine is, therefore, used mainly to distinguish the ancient and culture-bound health care practices, which existed before the application of science to health matters in modern scientific medicine or allopathy.

The herbal system of medicine which are considered to be Indian in origin or the systems of medicines, which have come to India from outside and got assimilated in Indian culture (Prasad, 2002). India has the unique distinction of having six recognized system of medicines. AYUSH signifies a combination of alternative system of medicine, which was earlier known as Indian System of Medicine. AYUSH includes Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy. Though Homoeopathy came to India in 18<sup>th</sup> Century, it completely assimilated in to the Indian culture and got enriched like any other traditional system hence it is considered as part of Indian System of Medicine (Prasad, 2002). Apart from these systems there are large numbers of healers in the folklore stream who have not been organized under any category.

Ayurveda is one of the oldest traditional medicinal system and considered as the most sacred par excellence and honoured by those proficient in the Vedas. The basic fundamentals are pancha-mahabhutas and tridosa. The three dosas, namely vata, pitta and kapha which are biological representatives for physiological functions in the state of homeostasis and for pathological disorders in the state of imbalance. Vata translates into wind, corresponds to mind and nervous system, pitta translates into fire or bile and is responsible for all metabolic transformation including digestion and assimilation of food and kapha translates into water and mucous for anabolic functions such as development of muscles and bone tissues. The vitiation of pitta dosa leads to impairment of Agni resulted into Amlapitta (hyperacidity), grahani roga (malabsorption syndrome) and other gastro-intestinal disorders. The composition and properties of drugs desired on the basis of Mahabhutas and actions of drugs described on the basis of Tridosa, are provided by simple medicinal plant with marvellous therapeutic effects.

Ayurvedic preparations are invariably complex mixtures based mostly on plant products in the form of extract, powder, guggulu, ghirta, churnas, tilas, asava and aristas (fermented fruit syrup).

Ayurveda is more prevalent in the states of Kerala, Maharashtra, Himachal Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Uttar Pradesh, Delhi, Haryana, Punjab, Uttarkhand, Goa and Orissa.

Siddha system is one of the oldest system in India which means 'achievements' and Siddhars were saintly persons who practiced and achieved results in medicine. The system believes that everything in the world and the universe around it are made up of five basic elements - earth, water, fire, air and space. The diagnosis of the disease involves identification of their causes and is done with the help of Panch-nidan which are the five diagnostic modalities (pulse, urine, eyes, voice and colour of the body) (Mukerjee, 2008). This system is effective in treating chronic diseases of liver, skin (psoriasis), rheumatic problems, anaemia, prostate enlargement, bleeding piles and peptic ulcers.

The medicinal formulations include the herbal products, inorganic substances (mercury, silver, arsenic, lead and sulphur) and animal products and lead to different formulations like chendooram (reddish powder medicine), choornam (powdered drug) and chunmam (medicaments prepared by calcinations). Siddha system is practiced in the areas of Tamil Nadu, Pondicherry and Kerala.

Unani system of medicine originated in Greece, passed through many countries and entered India during the Medieval period, which emphasises the use of naturally occurring, mostly herbal, animal and mineral medicines. It is more

efficacious in rheumatic arthritis, jaundice, filariasis, eczema, sinusitis and bronchial asthma and also is excellent remedy for gastrointestinal, cardiovascular and nervous disorders. Various types of treatments are prescribed in this system like regimental therapy, dietotherapy and pharmacotherapy. In this system the humoral theory presupposes the presence of several humors – Dam (Blood), Bhalgham (Phlegm), Safra (Yellow bile) and Souda (Black bile) in the body. This system believes that every person has a unique humoral constitution, which represents the healthy state. Single drug of different origins viz. plant, mineral and animal are prepared in the form of powder and used as such or in tablet form, mixed with sugar or honey and made into semisolid preparation and used (Mukerjee, 2008).

The practice of Unani System could be seen in some parts of Andhra Pradesh, Karnataka, Jammu & Kashmir, Bihar, Maharashtra, Madhya Pradesh, Uttar Pradesh, Delhi and Rajasthan.

Homoeopathy system of medicine was found by a German physician Samuel Hahnemann in 1790 which was based on the idea that each person is constitutive of mental, physical and emotional makeup.

The first basic principle of the system is that, a medicine which can induce a set of symptoms in healthy human beings would be capable of curing a similar set of systems in diseased state and this is called human drug pathogenicity study. The second principle is the use of single medicine at a time for a particular patient during the treatment. The third principle is the use of minimum dose of least potent dose of the drug which would provide full and complete cure without side effect.

This medicinal system also believes that the causation of the disease mainly depends upon the susceptibility or proneness of an individual to the incidence of particular disease in addition to external agents viz, bacteria and virus. The medicines are prepared according to Hahnemann method of “potentizing” homeopathic remedies by diluting them in water - alcohol solution and then vigorously shaking (or succussing) the mixtures (Mukerjee, 2008). A high degree of dilution is used in-order to minimise the side effects of the remedies as well as simultaneously enhance their medical efficacy.

The Homeopaths usually prescribe doses of dilution ratios ranging from 1x (1 part substance to 9 parts dilution medium) to 200c (200 repetition of diluting 1part substance with 99 parts dilution medium). The homeopathic remedies are effective for certain disorders such as childhood diarrhoea, hay fever, asthma and flu.

Homoeopathy is widely practiced in Uttar Pradesh, Kerala, West Bengal, Orissa, Andhra Pradesh, Maharashtra, Punjab, Tamil Nadu, Bihar, Gujarat and the North Eastern States.

Amchi - Sowa Rigpa system of medicine was also recognized as a traditional system of medicine recently (September 2009). Sowa Rigpa, commonly known as ‘Amchi’ is one of the oldest surviving system of medicine in the world, popular in the Himalayan region of India. Mainly in Sikkim, Arunachal Pradesh, Darjeeling (West Bengal), Lahoul and Spiti (Himachal Pradesh) and Ladakh region of Jammu and Kashmir.

Ravishankar and Shukla (2007) briefly discussed the various system of medicine. Lot of literature and information are available for Ayurveda, Siddha

and Unani in printed form. However for Yoga and Naturopathy system there is no available literature because they are mainly non-drug therapies.

Nowadays many countries of the world started giving much importance to their own traditional and tribal medicines. Continued examinations of traditional plant medicines are required not only to establish quality control but also to strengthen research in evaluation of efficacy of herbal medicines. Modern scientific evaluations of herbal drugs are mainly concern about the validation of the traditional uses of herbal medicines. Unexplored wonders and phenomena which lay in the depth of traditional system are to be studied and integrated with existing system.

A great part of the modern pharmaceutical industries has been developed on the basis of medicinal plants discovered with the aid of ethno-botanical knowledge of people and local communities (Aguilar, 2001; Kartal, 2007). Modern Pharmacopoeia contains at least 25% of drugs derived from plants and many others, which are synthetic analogues, built on prototype compounds isolated from plants (Farnsworth *et. al.*, 1985; Astin, 1998).

The natural products derived from medicinal plants used in traditional medical system have proven to be an abundant source of novel biological active compounds - many of which have been the basis for the development of new lead chemicals for pharmaceuticals and for drug discovery (Palombo, 2006).

The evaluation of these drugs are mostly based on pharmacognostical, phytochemical and pharmacological allied approaches including various instrumental techniques like chromatography and microscopy. With the emerging

interest in the world to adopt and study the traditional system and to exploit their potential based on different healthcare systems and rich heritage

More than 90 different alkaloids have been isolated from *Catharanthus roseus*. Among them, two well known alkaloids such as vinblastine and vincristine have the antitumor activity. Strychnine from *Strychnos nux-vomica* is used in the treatment of nonketotic hyperglycinemia and sleep apnea, and as a rat poison. Micofine and papaverine have been reported from *Nicotiana tobaccum* for smooth muscle relaxation and cerebral vasodilation. Morphine has been reported from *Papaver somniferum* (Opium) as powerful pain killer. Quinine from *Cinchona pubescens* used for malaria. Atropine, hyoscyamine, belladonine alkaloids obtained from the leaves of *Atropa belladonna* Linn. are being used as anti muscarinic agents and spasmolytic drugs. Cocaine from *Erythroxyllum coca* and *E. truxillense* is used to control severe pain associated with terminal cancer and acts as a stimulant on central nervous system (CNS). Reserpine isolated from *Rauwolfia serpentina* as antihypertensive and antipsychotic agent (Kokate *et. al.*, 2000).

Various flavanoids were isolated such as Silymarin (Alvarez Barreto and Clausen, 2002) obtained from *Silybum marianum* Linn as a therapeutic potential in protecting intact liver cells, chronic inflammatory liver conditions and cirrhosis. Kaempferol from the aerial parts of *Leptadenia pyrotechnica* (Amal *et. al.*, 2009) used for its strong anti-oxidant and anti-inflammatory functions. It is a therapeutic agent in the treatment of cancer, cardiovascular diseases and neurological disorders.

Terpenoids of plant origin with therapeutic value that has wide popularity are Artemisinin - a sesquiterpenoid isolated from the leaves and flowering tops of *Artemisia annua* Linn. (Asteraceae) used for malaria (Sing *et. al.*, 1986). It is active against *Plasmodium vivax* and against both chloroquine, sensitive and resistant strains of *Plasmodium falciparum*. Parthenolide sesquiterpenoid (Groenewegen *et. al.*, 1992) from the leaves of *Tanacetum pathenium* Schultz-Bip reported as antipyretic and febrifuge. Forskolin isolated from the roots of the *Coleus* reported to have high therapeutic potential in diseases such as congestive cardiomyopathy and bronchial asthma (Patel, 2010). Taxol isolated from the bark of *Taxus brevifolia* Nutt. used in the treatment of antineoplastic, metastatic carcinoma of the ovary and breast cancer (Markman, 1991).

Steroids of plant origin are Digitoxin (*Digitalis purpurea*), gitoxin and gitaloxin glycoside (Stoll, 1959) from dried leaves of *Digitalis dubia*, *D. ferruginea*, *D. grandiflora*, *D. lanata*, *D. lutea*, *D. mertonensis*, *D. nervosa* are reported for therapeutic activity in case of congestive heart failure.

Hellebrin from the dried rhizome and roots of *Helleborus niger* possess cardiac stimulant properties (Karrer, 1943). Hellebrin (Black hellebore) from dried rhizome and roots of *Hellebores niger* Linn. (Ranunculaceae) has been reported for cardiac stimulant properties whereas the green hellebore (*Veratrum viride*) is a cardiac depressant.

Many medicinal plants have been claimed to cure various ailments as well as boosting the immune system. The collaboration between botanists, chemists, pharmacologists and clinicians of various universities and research institutions facilitated the clinical evaluation of many compounds which provided great

impetus to the development of phyto-chemistry and pharmacology. The authentication and development of scientific quality standards as well as their toxicity profiles of herbal compounds by employing scientific methods is absolutely necessary when they are used as therapeutic agents.

Thousands of species are yet to be explored for their potentially active compounds and a systematic scientific investigation is necessary to bring out the best out of them for the benefit of mankind. Scientific investigation of a medicinal plant not only demonstrates the type of activity which has been reported in the literature but also at times brings out newer and more beneficial information.

The plant *Carmona retusa* (Vahl) Masam has been reported as one of the important medicinal plants in Siddha System of Medicine and Ayurvedic System of Medicine and also it is one of the important traditional medicinal plants in Sri Lanka and Philippines. Hence, this plant was taken for the present study to carry out the pharmacognostical, phyto-chemical, pharmacological and antimicrobial studies. These studies will help in the proper identification and authentication of the plant.