

# *Introduction*

## 1. INTRODUCTION

Nature has been a source of medicine for thousands of years and the use of plants for prevention and treatment of various health ailments has been in practice from time immemorial. Out of the 2,50,000 to 5,00,000 plant species on the earth, only 1-10% have been studied chemically and pharmacologically for the drug discovery. The importance of ethanobotanical indigenous knowledge is ever increasing to design plant based drugs for sustainable use and standardization of appropriate drugs and dose-illness relationship (Poonam and Singh, 2009). Traditional healers are best known for the usage of medicinal plants. On the basis of their existing knowledge on herbs, they have also revealed that the extracts of these crude drugs are highly efficient. (Petrovska, 2012).

India is known for its rich biodiversity and its indigneous benefits has been proved to be significant than allopathy, with least side effects. The traditional medicine integrated with modern medicine has gained popularity in recent advanced biology such as Pharmacology, Ethanopharmacognosy, Chemistry and other disciplines as “Green medicine”. World Health Organisation (WHO) has reported that global market for the medicinal plants and herbs is worth US \$ 14 billion per annum (Sharma, 2004 ) and US\$ 1 billion per annum in India (Joshi *et al.*,2004 ; Joshi *et al.*,2009). To add to it, the demand for plant based products has gained attention at the rate of 15-25% and it is expected to increase up to more than US \$5 trillion by the year 2050 (Kala *et al.*, 2006). Thus plants prove to be economically sole sustainable natural resource as Pharmaceuticals, Additives, Pesticides, Agrochemicals, Fragrance and Flavor Industries.

The increasing demand for medicinal plants globally requires more herbal raw materials and it is difficult to synthesis natural compounds through synthetic chemistry which is economically paralysed (Shahzad & Saeed, 2013) .

The source of medicinal plants has highly contributed to secondary metabolites (Croteau *et al.*, 2000), World health organization (WHO) in 2002 reported that 70% of world’s population depend on medicinal plants and it has attained significant popularity in overall health care system for the treatment of various ailments and diseases. According to recent report 85% of top selling herbal

drugs are persistently obtained from medicinal plants with wide usage in traditional health care system (THCS) (Bhattacharya *et al.*, 2003; Phondani *et al.*, 2014). According to Food and Drug Administration 13 new drugs from plant origin along with more than 100 natural product based drugs has been introduced for clinical studies. (Vederas., 2011)

India has ranked second after China in usage of plants as traditional applications for various diseases. Out of 18,000 species of higher plants, 7500 are reported to be in significant medicinal usage (Chen *et al.*, 2016). In health perspective, Plant derived chemical entities become significant among human nutrition. These chemical entities (secondary metabolites) doesn't contribute for growth and development in plant but plays a vital role in survival under ecological conditions (Choi *et al.*, 2012).

Since our country has rich biodiversity due to its potential usage in medical field, many of the species have acquired threatened status and extinction. So there is an urgent need for conserving these medicinal plants by domesticating and cultivating the plants worldwide (Chen *et al.*, 2016).

One of the criteria to protect the plants is availability of plant material for drug extraction. These extraction method has become priority agenda in international meetings as obligations to prevent over exploitation of plant resource (Rao *et al.*, 2003).

This traditional healing system suits for physical as well as psychological well being of humans. It includes all kinds of medicines such as folk, unconventional medicine, and therapeutic method which had been familiar among ethnic community or indigenous group. This tradition group has own culture, religious rites, food habit and rich knowledge of traditional medicine. The traditional people with enriched indigenous knowledge on plants are in practice to cure many ailments especially snake bite, even today. The plants which are screened over thousands of years ago exhibit the most phytochemical properties for therapeutically effective new drugs such as Antimicrobial, Antioxidant, Antihepatotoxic and Anticancer compounds (Dewick., 1996; Phillipson, & Wright, 1996).

Available medicinal plants have less pharmacognostic data such as morphology, anatomy and phytochemical contents. Evaluation of such data and screening based on these details is very much necessary to avoid ambiguity and identification of plants and their authentication.

More over assessment of physicochemical parameters focused on quality and quantity of the phytochemicals exhibit the properties of exclusive drugs. The therapeutic value of herbal medicine were assessed by the ancient physicians in Ayurveda and empirically recorded (indigenous system of medicine) which gives a basic foundation of ancient medical science in India .

Several plants have been reported for their anti-inflammatory, analgesic and antipyretic properties apart from antimicrobial nature. But the screening of plants with anticancer activity is of great challenge inspite of the fact that ethanopharmacognosy has played an important role in treating cancer.

According to a recent report by The National Cancer Institute, about 35,000 plant samples from 20 countries have been screened for anticancer activity (Shoeb, 2006) . In that 3000 species of plants has antitumour compounds (Hartwell, 1982). Over 50% of the anticancer molecules isolated from natural resources were in trials for screening the potential of anticancer properties. (Newman *et al.*, 2000). Some of the plant based anticancer compounds includes podophyllotoxin, taxol, vincristine and camptothecin. (Pezzuto, 1997). Numerous *Invitro* and *Invivo* methods have been introduced to ensure the anticancer properties of plants either as pure compounds or as plant extracts.

All the above facts have initiated in making an attempt on the identification of medicinal plants with potential anticancer activity from “Velliangiri hills” near Coimbatore, Tamilnadu, India. known for its Wealth of Medicinal plants. Majority of the people living in this area, with traditional knowledge heal many ailments and disease (Jagathes Kumar *et al.*, 2015). Ethanobotanical resources in Velliangiri hills provide economic benefits to the tribes. The survey and documented area occupies the southern most part and the spur of Nilgiri biosphere reserve of southern western ghats, that lies between the 6° 40’ to 7° 10’ E longitude, 10° 55’ to 11° 10’ N latitude and forms a part of western boundary of Coimbatore District, Tamil Nadu bordering the Palghat District of the State of Kerala.

The survey has been done among local people regarding medicinal value, mode of preparation and IUCN status of medicinal plants in Velliangiri hills market (Poondi) Coimbatore district, Tamilnadu, India. The survey of numerous commercially sold medicinal plants by Velliangiri hill tribes and local shop respondents were documented. These plants inhabits healing properties of various diseases such as fever, hepatitis, cold, cough, malaria, piles, sexual complications, snake bite, cancer, tumour and many skin related disorders. The information gathered during survey reflects the medicinal plants usage, their parts, dosage and time of collection for medicinal use. Hence Velliangiri hills proves to inhabit many medicinal plants. The survey was made to exhibit the important medicinal plants usage. Among numerous medicinal plants three plants were selected for further research and investigation. The three plants were selected based on therapeutical properties and prevalent uses among tribes in Velliangiri foot hills such as anticancer, anti helminths, anti-HIV and skin related ailments.

### **Plants Selected for the Present Study**

Three plants with pharmacological properties were screened for further research and investigation based on the following methods. (Suffness and Douros, 1979)

1. Random use of plant species
2. Based on ethanomedicinal use
3. Existing literature on their pharmaceutical use

### **Plants selected were**

- A. *Annona muricata* L.
- B. *Spermacoce articularis* L.f.
- C. *Rauvolfia tetraphylla* L.

### ***Annona muricata* L.**

*Annona muricata* L. locally called as “Seemai mundiri” is a small upright evergreen tropical fruit tree. It belongs to the family Annonaceae, the custard apple family with about 2500 species and more than 130 genera (Slik, 2003; Pier, 2008). It has biologically active compounds which are effective as anti-HIV, anticancer (Yu,

1999), antimicrobial (Chukwuka *et al.*, 2011), insecticidal properties (Kumar *et al.*, 2010) and useful cytotoxic components in the plants. (Kingston, 1992). The phytochemical analysis of *Annona muricata* L. indicates that the extract contains secondary metabolic compounds such as alkaloids, terpenoids, flavonoids, anthraquinones, tannins, cardiac glycosides, saponins (Gavamukulya *et al.*, 2014). These compounds are called Annonaceous acetogenins (AGEs) which initiates cytotoxic properties by inhibiting mitochondrial DNA (Sies, 1993).

### ***Spermacoce articularis* L. f.**

*Spermacoce articularis* L.f. is a commonly used medicinal plant prevalent in Indian folk medicine. It is popularly known as “Nattaichuri” in Tamil or shaggy button weed in English. About 280 species have been distributed in subtropical and tropical regions in Asia and Africa etc. It is widely present in the western ghats of Kerala near Velliangiri hills, Coimbatore. It is a procumbent herb with long internodes. Leaves are subsessile, 1-3.5 cm long, oblong or elliptic, often rounded at the tip. Flowers are small and white in colour. Leaf decoction helps to relieve headache and its seeds cure dysentery and has broad antimicrobial activity (Soosairaj *et al.*, 2013).

The plant plays a vital role in removing signs of old age, purifies blood, and has anti-oxidant and anti-diarrhoeal activities. The leaf of this plant suppresses TNF production, exhibits anticancer activity and anti-rheumatism (Mukherjee *et al.*, 1993).

### ***Rauvolfia tetraphylla* L.**

*Rauvolfia tetraphylla* L. includes 1000 species of which five are inhabitants of India (Bhattacharjee, 2004). It is a woody shrub belonging to the Apocynaceae family, leaves are elliptic and ovulate. Inflorescence develops in axillary, with 5-7 white or yellowish flowered corymbs. Fruit is a drupe with seeds which are ovoid (Matthews, 1983). This plant is rich in alkaloids such as reserpine, deserpine, rescinnamine, sarpagine and thus proves to be economically important (Kokate *et al.*, 1998). The leaves of *Rauvolfia tetraphylla* L. are crushed and applied for snake bite. (Karthikeyani & Janardhanan, 2003). The roots are used in the treatment of cardiovascular diseases, and also act as a sedative agent. It has been used for uterine contraction in complicated delivery (Ramachandran & Ramesh Chand, 1986).

Due to its wide usage *Rauwolfia tetraphylla L.* is becoming critically endangered due to over exploitation by the people.

The main objective of the study is to bring out the pharmacognostic, therapeutic properties and the pharmacological importance of the three plants based on the following studies.

1. Morphological and anatomical studies
2. Physicochemical characters of crude drugs.
3. Qualitative and Quantitative phytochemical analysis of three selected medicinal plants
4. *Invitro* Studies to evaluate Phytochemicals for their
  - Antioxidant Activity
  - Anti-inflammatory activity
  - Antimicrobial Activity
5. To determine the compounds and functional groups responsible for the therapeutic property of the crude drugs by
  - Thin Layer Chromatography
  - FTIR Analysis
  - GC-MS
6. Heavy metal analysis with selected plants to ascertain the suitability of crude drugs for their medicinal value.
7. *In vivo* Pharmacology studies to determine
  - Acute Toxicity
  - Analgesic activity
  - Anti-pyretic activity
  - Anti-inflammatory activity using animal models
8. *Invitro* cytotoxicity assay to understand anticancer property by
  - Determination of mitochondrial synthesis by MTT assay
  - DNA Fragmentation assay