INTRODUCTION

The ancient literature is the greatest evidence and narrates how human race was always concern about being well and the use of medicinal plants to relive illness. In 1,600 B.C. Egyptians recorded the list of medicinal plants which were used by physician of that period. Greece has robust herbal medicinal history. Theophrastus wrote two large botanical treatises, ‘Enquiry into Plants’ and ‘On the Causes of Plants’. Hippocrates has been acknowledged as ‘Father of medicine’. He has coded the Hippocratic Oath which is still in use either in its original or modern version. It is said that Hippocratic Oath is influenced by Pythagoras school of thoughts which is mainly based on patient’s food habit, hygiene and care. Sumarian drawings of Opium (Poppy) capsules in 1,500 B.C. suggests a good knowledge of plants, but substantial record of the use of herbs in medicine comes from the Code of Hammurabi, a series of tablets carved under the direction of the King of Babylon in about 1,700 B.C. these tablets produced from henbane, licorice and mint which are still used in medicine as reported by Simpson and Ogorzaly, (2001). Dioscorides wrote “De Materia Medica,” addressing the medicinal properties of plants of that era. Chinese Emperor Shen Nung wrote “Pen T’Sao” book on roots and grasses in 2,500 B.C.

India is well known for its diversity of religion, culture, language, food, geographical conditions, education and socio-economic status. The Indian herbal medicinal history is a compound of Non-Aryan and Aryan contributions. Non Aryan includes, people living in and around forests well known as “Adivasi” exercises the medicinal herbs as chief and prime source of defense. Whereas, Aryan practiced Ayurveda and it was limited to certain segments of society. Classical Ayurveda has been enriched over centuries through the interactions and exchange with regional folk
practices. Historically, tribal medical tradition relied on their forest environments for healthcare and it has made invaluable contributions to the Materia Medica on traditional medicine (History of Indian healing tradition, 2015).

In India, there are four formal schools of medicines such as Unani, Rasashastra, Siddha and Sa-Rigpa. Unani is originated from Greek medicine culture and then later it became tradition of Arab. In India, Unani was prospered with the native medicine tradition and now still it is being practice in India and Pakistan. Use of purified metals like mercury and gold as remedy is followed in Rasashastra. In Tamil Nadu, an ancient tradition known as Siddha refers to a being who has achieved a high degree of physical as well as cognition enlightenment. It is said that this tradition is influenced by Chinese and Arab medicine customs. Sa-Rigpa is the blend of Vagbhata’s Ashtangahrdayam and folk practices along with a strong influence of Tibetan Buddhism.

Plants are the richest resource of drugs of traditional herbal medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs (Hammer et al., 1999). The World Health Organization (WHO, 2008) has defined medicinal plants as the plants that contains properties or compounds that can be used for therapeutic purposes or those that synthesize metabolites to produce useful drugs. The importance of medicinal plants and traditional health systems in solving the health problems of the world is gaining increasing attention. The information of total number of plant species and medicinal plant species of 13 countries which are most important source of medicines are depicted in Table: 1 (Duke and Ayensu 1985; Govaerts 2001; Groombridge and Jenkins, 2002; Jain and DeFillipps, 1991; Moerman, 1996; Padua et al., 1999).

Jiaxiang (1997) listed about 503 genera and 1620 species of medicinally important plants belonging to different families. He divided the list into monocots and dicots. In monocots, he mentioned Liliaceae and Orchidaceae as medicinally rich plant families whereas, in dicots he enlisted nine families viz. Asteraceae, Fabaceae,
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Ranunculaceae, Laminaceae, Rosaceae, Apiaceae, Rubiaceae, Euphorbiaceae and Asclepiadaceae.

India is not only consumer of medicinal plants and herbal medicine but also very important global producer (Holley and Williams, 1996). According to the world wide medicinal plant data, India ranked second and contributes 3,000 (20%) out of 15,000 total number of Indian medicinal plant species. India’s diversity is unmatched due to the presence of 16 different agro-climatic zones, 10 vegetation zones, 25 biotic provinces and 426 biomes (habitats of specific species). About 4,900 species of medicinal plants are endemic to India. These are distributed among 141 genera belonging to 47 families. These are concentrated in the floristically rich areas of North-East India, the Western Ghats, North-West Himalayas and the Andaman and Nicobar Islands. These areas constitute two of the 18 hot spots identified in the world.

Among 2,000 drugs being used in curing human ailments in India, only 200 are of animal origin, 300 are of mineral origin and the rest 1,500 drugs are extracted from various plants as reported by Ali and Soumyanath (2006). This indicates that medicinal Plants contain important compounds of medicinal use as reported by Hiremath et al., (1996). In many countries, herbal preparations which are found to be safe and effective are readily incorporated into modern medical system (Murray, 1999 and Kenner, 2001).

It is estimated that world trade for plant derived drugs may account for Rs. 2,00,000 crores. In this, Indian contribution is less than Rs. 2,000 crores. Indian export of raw drugs had steadily increased from 1991 till today, at present the annual production of aromatic plants’ raw material in India is about Rs. 500 crores. This may increase by three folds during 2050 as reported by Joy et al., (1998). The global herbal market was valued at 70 billion $ for nutraceuticals and 20 billion $ for phytomedicines with an average annual growth rate between 15 to 20% (Gruenwald and Hezberg 2002; Sloan 2002).
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At present, many compounds are derived from plants and have been isolated, formulated into drugs such as Acetyldigoxin isolated from *Digitalis lanata* and has cardiotonic action. Ajmalicine is from *Rauvolfia sepentina*, which shows action on circulatory disorders. Anabesine from *Anabasis sphylla* acts as a skeletal muscle relaxant. Caffeine from *Camellia sinensis* has (Central Nervous System) CNS stimulation activity. Etoposide extracted from *Podophyllum peltatum* has antitumor activity (Drugs from plants). Significant portions of these medicinal market products are from plant sources. Many allopathic medicines, which are produced synthetically, are also derived from plants such as quinine for malaria and quinidine for heart arrhythmia from *Cinchona* spp. and digoxin for heart failure from *Digitalis* spp. About 25% of drugs prescribed worldwide come from plants, 121 such active compounds are being in current use (Rates, 2001).

At present, plant and plant-based medications are the basis of the modern pharmaceutical industry to cure various ailments (Atal and kapur, 1982). Phytochemicals (from the Greek word phyto, meaning plant) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans. (Hasler and Blumberg 1999). These chemical compounds are of two types, primary and secondary metabolites. Primary metabolites are those which are required for growth and development of plant and secondary metabolites are the byproducts of metabolic pathway and play an important role in defense system of plant (Gibson, 1998; Mathai, 2000).

The branch of science which deals with the study of phytochemicals is called as Phytochemistry. It is the combination of botany and chemistry. When phytochemicals are obtained or derived from fruits or edible plants they are referred as "Phytonutrients". In order to address different aspect of plant and human race relationship, scholars have made different branches like Ethanobotany, Pharmacognosy and Pharmacology. Ethanobotany deals with the study of how communities of a particular region make use of indigenous plants for food, clothing and medicine (Aiyeloja and Bello, 2006). Pharmacognosy is the study of medicines derived from natural sources. Pharmacology is the branch of medicine and biology concerned with the mechanism of drug action.
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It was not until the 19th century when human began to isolate the active principles of medicinal plants and one particular landmark was the discovery of ‘quinine’ from Cinchona bark by the French scientists Caventou and Pelletier which leads to further discovery of phytochemicals in the world scenario (Phillipson, 1995).

In general, phytochemicals are known to have properties like antioxidant, antibacterial, antiinflammatory and anticancer. It acts as an enzyme stimulator; hormone regulator and it also interfere with DNA replication and bind physically to cell membrane protecting it from pathogen attack. The physiologic properties of relatively few phytochemicals are well understood and many more research has been focused on their possible role in preventing or treating cancer and heart disease (Mathai, 2000). Phytochemicals have also been promoted for the prevention and treatment of diabetes, high blood pressure and muscular degeneration (American Cancer Society, 2000). Efficacies testing of the traditional and new herbal products in experimental screening method are important to establish the active component and appropriate extract of the plant (Chakravarty, 1993).

Mwine and Damme (2011) has reviewed the important phytochemicals such as diterpenes, triterpenes, saponins, flavonoids, tannins, alkaloids, fatty acids, coumarins, sterols, phenols, essential oil and their medicinal properties such as antibacterial, antiviral, antifungal, nematicidal, molluscicidal, insecticidal and antileishmanial. In addition, there are many published data available on phytochemicals of different Euphorbiaceae members by Kothale et al., (2011), Mahajan and Budjurg, (2011) and Suresh et al., (2012) and Further, Phytochemical activities such as antimicrobial, antiamoebic, antidiarrhoeal, antiplasmodial, hepatoprotective, immunomodulatory, anticancer, antiasthmatic, antioxidant, antiinflammatory, antifertility and wound healing activities were reported in Jatropha curcas by Agbogidi et al., (2013).

In developing countries, bacterial and viral diseases are one of the most important reasons of morbidity and mortality. The prime challenge is emergence of resistance against formal antimicrobials and its transformation ability due to which resistance is propagated. To confront this problem, pharmaceutical companies are
adopter the strategy of changing the molecular structure of established medicines. But this strategy alone cannot resolve the problem. Therefore there is constant need for alternative remedy. This motivates researchers to explore flora and examine their antimicrobial activity. This situation has provided the impetus to the search for new antimicrobial substances from various sources like medicinal plants (Cordell, 2005).

The antimicrobial activity of plant oil and extracts has formed the basis of many applications, including raw and processed food preservation, pharmaceuticals, alternative medicine and natural therapies. Herbal species are important sources of antimicrobials, and the use of spices, their essential oils or active ingredients for controlling microbial growth in food materials constituents as an alternative approach to chemical additives (Shylaja and Peter, 2002). Antimicrobial agents derived from plants may include phytoalexins, isothiocyanates, alliins, allicins, plants pigments and phenolics compounds from herbs and spices. There is an increased need for safer antimicrobials food preservatives which are more acceptable than the present preservatives whose safety in food is sometimes questionable.

Plant based antimicrobials represent a vast untapped source of medicines with enormous therapeutic potential (Cowan, 1999). Many plants have been used as source of antimicrobial compounds, which are chiefly synthesized during secondary metabolism of the plant (Heinrich et al., 2004). Cell walls of at least some monocotyledons also contain antimicrobial proteins, referred to as ‘Thionins’ (Carr and Klessing, 1989). Plant cells contain sequestered glycosides and they are released when ruptured by injury or infection. These glycosides may have antimicrobial activity against the invading pathogens or may be hydrolysed by glycosidases to yield more active aglycones in the case of phenolic compounds, these may be oxidized to highly reactive antimicrobial quinines and free radicals (Dean and Kuc, 1987).

In general, Euphorbiaceae scores well in the index of medicinal power. The cited inventories in different parts of the world reveal that in Kenya 900 medicinal species have been recorded, among them 60 belong to Euphorbiaceae (Leakey, 2006), in Loja province (Southern Ecuador) there are 11 species of 214 (Bussmann and Sharon, 2006), in Jinja district (Eastern Uganda) there are 5 out of 88 (Bukenya-
Ziraba and Kamoga, 2007), In Sango Bay area (SouthernUganda) there are 14 out of 186 (Ssegawa and Kasenene, 2007), in Riau province, Sumatra, Indonesia, there are 11 out of 114 (Grosvenor et al., 1995). This approximates to about 7% of the species cited (Mwine and Demme, 2011). Bijekar and Gayatri (2014) has enlisted Ethanomedicinal properties of 108 Euphorbiaceae members and concluded that Euphorbiaceae family is rich source of medicinal constituents which further need to be explored.

Mwine and Demme (2011) concluded in their review that their diverse medicinal properties are associated with their wide distribution which is supported by their survival adaptations such as succulence and CAM pathway. The exposure to a wide range of habitats predisposes them to inevitably high mutation loads (accruing from stressful habitats) and a large range of environmental stimuli hence the necessity to develop a wide battery range of defensive secondary metabolites.

Keeping this in view, in the present investigation, the phytochemical qualitative and quantitative tests; phytochemical fingerprinting, isolation of flavonoid factions; their antimicrobial, antioxidant and anti-inflammatory activities, quercetin quantification by HPLC and phytochemical profiling through GC-MS; acceleration of flavonoid synthesis in callus culture and nanoparticles synthesis of three important members of Euphorbiaceae family is carried out with following objectives:

1. COLLECTION AND MAINTENANCE of *Baliospermum montanum*, *Drypetes roxburghii* and *Codiaeum variegatum* members of Euphorbiaceae.

2. TO ESTIMATE PHYTOCHEMICALS QUALITATIVELY

   Qualitative estimation of alkaloids, anthraquinones, carbohydrates, cardiac glycosides, coumarins, fatty acids, flavonoids, gum and mucilage, proteins and amino acids, saponins, steroids, tannins and terpenoids from crude extracts of different plant parts of *B.*
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montanum, D. roxburghii and C. variegatum by using seven different solvents

3. TO ESTIMATE PHYTOCHEMICALS QUANTITATIVELY
Quantitative estimation of alkaloids, flavonoids, saponins, tannin, phenols and terpenoids from different plant parts of B. montanum, D. roxburghii and C. variegatum by following standard methods.

4. TO DEVELOP PHYTOCHEMICAL FINGERPRINT
Development of phytochemical fingerprint by computing the phytochemical qualitative results of B. montanum, D. roxburghii and C. variegatum

5. TO ISOLATE FLAVONOID FRACTIONS
Isolation and Separation of flavonoid fractions through silica gel chromatography from methanol crude leaf extract B. montanum, D. roxburghii and C. variegatum.

6. TO ESTIMATE ANTIINFLAMMATORY ACTIVITY OF ISOLATED FLAVONOID FRACTIONS
In vitro estimation of cytotoxic and antiinflammatory activity of isolated flavonoid fractions from methanol leaf extract of B. montanum, D. roxburghii and C. variegatum against RAW264.7 cell lines.

7. TO ESTIMATE ANTIOXIDANT ACTIVITY OF ISOLATED FLAVONOID FRACTIONS
Estimation of antioxidant activity of isolated flavonoid fractions from methanol leaf extract of B. montanum, D. roxburghii and C. variegatum by ABTS and DPPH assay.

8. TO ESTIMATE ANTIMICROBIAL ACTIVITY OF ISOLATED FLAVONOID FRACTIONS
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- To estimate antibacterial activity of isolated flavonoid fractions from methanol leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum* against *Escherichia coli*, *Salmonella typhimurium* and *Pseudomonas aeruginosa*.

- The antifungal activity of isolated flavonoid fractions from methanol leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum* tested against *Aspergillus fumigates*, *Aspergillus niger* and *Microspora gypseum*.

9. TO ACCELERATE FLAVONOID SYNTHESIS IN IN VITRO CULTURE

- Induction of callus from internodes of *B. montanum*, *D. roxburghii* and *C. variegatum*.
- Elicitor treatment in suspension culture.
- Extraction and quantification of accelerated flavonoids.

10. TO OBTAIN GC-MS PROFILE

GC-MS analysis of methanolic leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum* subjected and Interpretation of compounds on the basis of NIST library.

11. TO QUANTIFY QUERCETIN CONTENT

Quantification of quercetin in methanolic leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum* through High Pressure Liquid Chromatography (HPLC) analysis.
12. TO SYNTHESIZE SILVER NANOPARTICLES

- Induction of nanoparticles synthesis from aqueous leaf extract of *B. montanum*, *D. roxburghii* and *C. variegatum*
- Characterization of synthesized silver nanoparticles from *B. montanum*, *D. roxburghii* and *C. variegatum* by UV-Vis spectrophotometer.
- Antimicrobial activity of synthesized nanoparticles against *E. coli* by growth curve method.