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### 1.0 INTRODUCTION

Nature has bestowed India with an enormous wealth of medicinal plants; and thus India which is rich in biodiversity, has often been referred to as ‘*Medicinal Garden of the World*’. Recently there has been a shift in universal trend from synthetic to herbal medicine, which we can say as ‘*Return to Nature*’. Medicinal plants have been known for millennia and are highly esteemed all over the world as a rich source of therapeutic agents for prevention of diseases and ailments (*Sharma et al., 2008*). Plants exert multifarious influences on the mode of human life. They provide numerous products and materials for the use of mankind in myriad ways. Among them, their medicinal use influence especially greater significance in the man’s life, since they provide materials which help in curing diseases. They also provide nourishment and protective substance for the good health of human being. Because of this fact, people have been using plant products as medicine for curing variety of diseases since the time immemorial.

The first generally accepted use of plant as healing agents was depicted in the cave paintings discovered in the Lascaux caves in France, which have been radiocarbon dated to between 13,000-25,000 BC. Plants have almost limitless ability to synthesize aromatic substances, most of which are phenols or their oxygen-substituted derivatives such as tannins.
The use and search for drugs and dietary supplements derived from plants (Samuelsson, 2004) have accelerated in recent years. Herbal medicines are now in great demand in the developing world for primary healthcare not because they are inexpensive but also as they have better cultural acceptability, better compatibility with the human body and minimal side effects.

The widespread use of herbal remedies and healthcare preparations, described in Bible and in Vedas are obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed (UNESCO, 1996).

WHO has delineated a working definition for traditional medicine as including diverse health practices, approaches, knowledge and beliefs incorporating plant, animal and / or mineral based medicines, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being as well as to treat, diagnose or prevent illness (WHO, 2001).

A recent survey conducted by WHO, approximates 80% of the world population to depend mainly on the traditional medicines for primary health care (Bannerman, 1983). Herbals are moving from fringe to main stream (Bahadur et al., 2007). In the modern time, vast medicinal resources of plant kingdom are depleting rapidly with the increases of population and the excessive biotic activities. If this trend of constant depletion of medicinal plants continues this may cause an acute paucity of the resources of medicinal plants in future and pose a very serious threat to the physical well being of mankind.

Plants have a great potential for producing new drugs of great benefit to mankind. There are many approaches to the search for new biologically active principles in higher plants (Farnsworth and Loub., 1983). Many efforts have been done
to discover new anti microbial compounds from various kinds of sources such as soil, microorganisms, animals and plants. One of such resources is folk medicine and systematic screening of them may result in the discovery of novel effective compounds (Janovska et al., 2003).

Plants have an almost limitless ability to synthesis, aromatic substances most of which are phenols or their oxygen –substituted derivatives (Geissman, 1963). Most are secondary metabolites of which at least of 12,000 have been isolated, a number estimated to be less than 10% of total (Schulte, 1978). In many cases, these substances serves as a plant defense mechanisms against predation by microorganisms, insects and herbivores. The medicinal value of plant lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds of plants are alkaloids, flavanoids, tannins and phenolic compounds.

It is estimated that there are 2, 50, 000 to 5, 00,000 species of plants on earth (Borris, 1996). A relatively small percentage [1 to 10%] of those is used as food by both humans and other animal species. It is possible that even more of them are used for medicinal purpose (Moreman, 1996).

Medicinal plants are the local heritage with global importance. The variety sheer number of plants with therapeutic properties is quite astonishing. It is estimated that around 70,000 plant species are used for medicinal purpose. The herbs provide the starting material for the isolation or synthesis of conventional drugs. In India, medicinal plants have made a good contribution to the development of ancient Indian medical material (Prajapati et al., 2003).
According to an estimate of the world health organization about 88% of the populations in developing countries rely on traditional medicine for their primary health Care needs. More than 20,000 species of higher plants are used as medicines in the traditional treatment practices of indigenous culture, living around the world (Panda, 1970).

The use and search for drugs and dietary supplements derived from plants have auelerated in recent years. Ethnopharmacologists, botanists, microbiologists and natural products chemists are combing the earth for phyto chemicals and leads which could be developed for treatment of infectious diseases (Cowan, 1999).

Plants have supplied 25% prescription drugs used in human medicine and such pharmacologically active plants have also provided leads to natural pesticide plants are called “Biomedicine” (John Mitchell, 2002).

Analysis of habits of medicinal plants indicates that they are distributed across various habitats. One third is trees and an equal portion shrubs and the remaining one third are herbs, grasses and climbers. A very small proportion of the medicinal plants are lower plants like lichens, ferns, algae, etc., majority of the medicinal plants are highly flowering plants. The plant parts used for the medicinal purpose include Leaves, stem barks and root barks (Anonymous, 1987). Plants are ethanopharmacological diuretic, laxative, lithonotriptic, antirehumatic, antiperiodic, bittertonic, rubifacent and counterirritant (Nadkarni, 1979). Bark is used in the urinary disorders including kidney and bladder stones, antiemetic, and calculous affections and as an antidote in snakebite (Bhattachargee, 2001).
The state of Tamil Nadu in India is endowed with a very rich flora. Due to the various physiographic features and physiognomic factors, a different type of vegetation exists in the state - 1. Coastal vegetation; 2. Island vegetation; 3. Vegetation of hills and mountains comprising of Dry deciduous forests
Moist deciduous forests.
Semi –Evergreen forests.
Wet Evergreen forests
Sholas [Southern montane wet temperate forests].

The altitude varies from sea level to 2637m including the well known mountain ranges – the Nilgiris, the Anamalais and the Cardamom hills which harbour different types of ecological niches, ecosystems and innumerable medicinal plants. A few ethnic tribals like the Irular, Kaanikkara, Karupur, Palliyangal, Panpirar, Sholagar, Thodar, Malayalis and others dwell in these ecosystems and still depend on naturally occurring or cultivated plants from the state (Nair and Henny, 1983) and out of this, it is found that 1474 plants have medicinal value. A total number are found to be used in Siddha system of medicine which is commonly practiced throughout the state.

Use of plants for medicinal purposes is an important part of the culture and the tradition in India. It stated that 80% of the population depends directly on the traditional medicine for the primarily health care (Anand et al., 1979). Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases (Asscher, 1980).

The search for herbal remedies to relieve pain and heal diseases drove early man to explore the natural resource surrounding him particularly the plants. Most of the plants are major
source of natural products used as pharmaceuticals, agrochemicals, flavor and fragrance ingredients, food additives and pesticides. Large number of primary metabolites acts as precursors of pharmacologically active metabolites in pharmaceutical compounds for the synthesis of drugs. Millions of the people in the third world still use the herbal drugs (Audichya et al., 1983).

Since the beginning of the human civilization, plants have been one of the most important sources for medicine. Inspite of tremendous development in the field of Allopathy, plants still form one of the major sources in modern as well as traditional medicine throughout the world. India is a store house for medicinal plants. About 70% of rural folk depend on medicinal plant for their health care. Six hundred and twenty seven plants are known to be used in the country for medicinal purpose in which they are cultivated in 70 acres. It is interesting to note that out of 1800 flowering plants 800 are having medicinal importance.

Ayurvedic medicine is also called Ayurveda. It is a system of medicine that originated in India several thousand years ago. The term Ayurveda combines two Sanskrit words. Ayur which means life and Veda, which means Science or Knowledge. Ayurveda means “The Science of life” (Altschuler et al., 2007).

Ayurveda uses herbs and exercise to prevent illness. Siddha uses methods and medication, such as intense yogic practices, periodic fasting and meditation to achieve supernatural powers and immortality.

Both Ayurveda and Siddha are types of treatment system developed in India. They both depend mainly on natural remedies and exercise to prevent and treat illness. Ayurveda predates Siddha, and each has been developed in two different regions of India. Ayurveda was
incorporated in ancient Vedic texts, whereas Siddha was written on palm leaf manuscripts in Tamil Nadu. Both believe that imbalance in the body creates illness or disease.

Ayurveda and Siddha emphasize the balance of three elemental energies or humors: Vayu / vata (air and space – "wind"), pitta (fire and water – "bile") and kapha (water & earth – "phlegm"). They believe that an imbalance of these create a disease. The difference among them is that, Siddha medicine recognizes predominance of vata, pitta and kapha in childhood, adulthood and old age, whereas Ayurveda recognizes predominance of kapha, pitta and vata in childhood, adulthood and old age, respectively.

Another difference is that Ayurveda emphasizes on using herbs and minerals, a need for healthy metabolic system, good digestion and proper excretion we need to do exercise, yoga, and meditation, in order to keep the body healthy and to avoid diseases. Whereas, Siddha promotes using methods and medication, such as intense yogic practices, including years of periodic fasting and meditation, in order to strengthen the physical body and soul to attain supernatural powers and immortality. Siddhars, who supposedly attained supreme knowledge through this spirituality, wrote scriptures on all aspects of life, from arts to science and truth of life which miracled the cure of diseases.

Herbal medicine also called botanical medicine or phytomedicine refers to plant's seeds, berries, roots, leaves, bark or flowers for medicinal purpose. Herbalism has a long traditional use outside conventional medicine. An advance in clinical research shows improvement in analysis and quality control of herbal medicine in treating and preventing diseases which becomes a mainstream medicine (Gratus et al., 2009).
Use of herbal medicine in India represents a long interaction with the Environment. Plants used for traditional medicine contain a wide range of substance that can be used to treat chronic as well as infectious disease (Duraiyandiyan et al., 2006).

Siddha medicine is one of the oldest medical systems known to mankind. This system of medicine originated from south Indian Tamil traditional medicine, as part of the trio Indian medicines - Ayurveda, Siddha and Unani. This system was very popular in ancient India. Believed to be more than 10,000 years old, the Siddha system of medicine is considered to be one of the most antiquated traditional medical systems. In India, from ancient times, different parts of medicinal plants have been used to cure specific ailments. Today, there is a widespread interest in drugs derived from plants. This interest primarily stems from the belief that medicine is safe and dependable, compared with costly synthetic drugs that adverse effects. Natural antimicrobials can be derived from plants, animal tissues or microorganisms (Anand, et al., 1979). The short comings of the drugs available today, propel the discovery of new pharmacotherapeutic agents in medicinal plants. To determine the potential and promote the use of herbal medicine, it is essential to intensify the study of medicinal plants that find place in folklore (Asscher, 1980) long spidery stamens. It is native to Japan, Australia, much of Southeast Asia and several south public islands. It is grown elsewhere for fruit, especially in parts of the African continent.

Microbes are single cell organisms and present in water, food, air and approximately in all places. The major types of organisms are bacteria, fungi, protozoa. They are able to cause various diseases such as respiratory disease, skin disease, brain disease, intestinal and Urinary tract disease.
The Unani system of medicine is traced from the system of Greek medicine developed during the Arab Civilization and is also called the Greco-Arab system. The name Unani (Ionian) is considered to be indicative of the Greek origin of the system, though the European historians call it Arab medicine and now it is prevalent in India, Pakistan and Bangladesh. It had gone also to places where the Asian Muslims took it along. According to the Unani system of medicine, the plant has been used as a carminative, tonic, emmenagogue, aphrodisiac, alexipharmic; improves the appetite; good for rheumatism, lumbago, cough and asthma (Chopra et al., 2006). In Unani system of medicine, the bark is used to promote appetite and to decrease the secretion of bile and phlegm (Mukesh et al., 2010). Folkloric uses suggest its potentiality as oxytocic, diuretic, laxative, anti-periodic, and bitter tonic (Patil et al., 2011). In tribal areas of Muzaffarnagar (Uttar Pradesh, India), this is used against urinary disorders including kidney and bladder stones, anti-emetic and as antidote in snakebite (Mhaskar et al., 2000). Tribals of eastern India (Assamese, Khashi, and Garo) apply the leaf paste against various joint disorders. Roots and barks are used as laxative and increase appetite and biliary secretion (Enamul et al., 2008). Varunal, a traditional Ayurvedic poly-herbal formulation containing Crataeva nurvala is used against hepatitis, edema, ascites, and arthritis (Mhaskar et al., 2000).

In the Unani system, temperament (mizaj) has an important place, and forms the basis of pathology, diagnosis and treatment. The Galenic concept of temperament being sanguine, phlegmatic, choleric or meloncholic, finds expression in the Unani system that considers each individual as unique. The modern psycho-neuro-endocrinical concept is often taken in support of the idea that temperament is unique to an individual and that a shift in the temperament brings about a change in the person’s state of health (Said, 1983). Thus, disease is the
consequence of humoral imbalance in the body and of the failure of one or more parts of the body to get rid of pathogenic waste from the body.

Bacterial infections can be caused by a wide range of bacteria resulting life threatening illness (such as bacterial meningitis) that require immediate intervention. In United States, bacterial infections are leading to death both in younger and older ones. Hospitalized patients and those chronic diseases are especially high risk due to bacterial infections. Common bacterial infections include pneumonia and it is generally recognized by our ancestors by using wide range of medicinal plants having healing powers. Until 28th century, every village and rural community has a wealth of herbal folklore. They have tried and tested local plants for range of common health problems. They were using herbal plants as teas and lotions or even mixed with lard and rubbed as ointment (Jafri et al., 2000).

A good number of populations particularly those living in rural areas depend largely on herbal remedies for the treatment of different types of diseases. It indicates the importance of the individual plants in the health care system (Kunwar and Bussman, 2008).

Medicinal plants have curative properties due to the presence of various complexes. Chemical substances of different composition are found as secondary plant metabolites in one or more part of the plants. The plant metabolites, according to their composition, are grouped as alkaloids; glycoside, corticosteroids, and essential oil etc., Nowadays, these medicinal valuable components obtained from the plants are used in curing ear infection, diarrhoea, Urinary tract infections and skin disorders.

Urinary tract infection [UTIs] is a common type of infection caused by bacteria most often Escherichia coli that travel up the Urethra to the bladder. A bladder infection is called cystitis. If bacterial infection spreads to the kidneys and Ureters, the condition is called
Pyelonephritis. Cystitis is considered a lower Urinary tract infection. Pyelonephritis is an upper Urinary tract infection and is much more serious.

Urinary tract infection [UTI] is defined as the presence of multiplying micro organism [Bugs] in the tract through which urine flows from the kidneys via the bladder to the outside world. It is a bacterial infection that affects any part of the urinary tract. Although Urine contains a variety of fluids, salts and waste products, it usually does not have bacteria in it. When bacteria get into the bladder or kidney and multiply in the urine, they cause UTI. The most common type of UTI is a bladder infection which also often called cystitis. Another kind of UTI is a kidney infection, known as Pyelonephritis, and is much more serious. Although they cause discomfort, Urinary tract infections are usually cured quickly by an early treatment from the medical practioners (Murray et al., 1995).

UTI is 50 times more common in women with about 5% per year developing symptoms. UTI is uncommon in men below 60 years of age, but the frequency is similar in men and women in older age groups. UTI are rare in men, so all cases require investigation Prostatitis, the infection or inflammation of the prostate a gland beneath the bladder that produces some components of semen causes symptoms that can be mistaken for UTI in men. In healthy men, urine is sterile and contains no micro organisms. The most important factor in maintaining the sterility of the urinary tract is emptying the bladder completely and frequently (Lane et al., 2004).

The cause of most UTI’s is bacteria that initially settle ecolonise around the urethra and then ascend into the rest of the urinary tract. Several factors can make this process more likely to occur. UTI is the most common bacterial infection occurs commonly with women than men. UTI in women develop when uropathogens, from the reservoir of fecal flora, colonize the vaginal
introits’, enter the urethra, ascent into the bladder, and stimulate a host response manifested by symptoms and in most cases, pyuria (Colgan and Williams, 2011).

Despite the effective antimicrobial defense of the urinary tract, bacteria sometimes win the 'first battle' against mucosal immunity and persist or invade the host then, more intense inflammation is needed with involvement of professional immune cells and with some inevitable degree of tissue damage. Cathelicidin is also an important player in these immune processes, in the recruitment of neutrophils and neutrophil mediated killing of bacteria (Edward, 1968).

It is also reported as the most common infections experienced by both male and female and is particularly responsible for discomfort in elderly patients, thus representing a risk of bactericidal, septic shock, respiratory distress syndrome and death. The susceptibility of the host and the presence of urinary tract pathogens are of primary importance in the development of infection. Common pathogens include Escherichia coli, Proteus species, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterococci faecalis and Staphylococcus aureus.

Even though Pharmacological industries have produced a number of new antibiotics in the last three decades, resistance to these drugs by microorganisms has increased. In general, bacteria have genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agents. Therefore, the use of plant extracts and phytochemicals, both with known antimicrobial properties can be of great significance in therapeutic treatment (Diallo et al., 1999).

According to World Health Organization, medical plants would be the best source to obtain a variety of drugs. Many efforts have been made to discover new antimicrobial compounds from various kinds of source such as plants, animals, and microorganisms (Janovska et al., 2003).
Plants are rich in a wide variety of secondary metabolites such as tannins, terpenoids, alkaloids and flavonoids. These substances that produce a definite physiological action on human body have been found in vitro containing antimicrobial properties. Plants possess antimicrobial natural products to protect themselves from microbial infection and deterioration (Cowan, 1999). There are growing interests in using natural antimicrobial compounds, especially extracted from plants, for the preservation of food and safety of synthetic activities. Health benefits are best obtained through the composition of the varied diet choosing fruits, vegetables, grains, leguminous and seeds which contain the phytochemicals.

Phytochemicals are referred to as phytonutrients; these items are often used interchangeably. In other terms, they are said to be chemicals or nutrients derived from plant sources. Although they are not required for normal functioning of the body they have a beneficial effect on health or an active role in the amelioration of disease (Gunthar and Wagner, 1996).

A minority claim that many of the diseases affecting the people of industrialized nations are the result of those people’s lack of phytonutrients in their diet. Phytochemicals are usually referred as chemical compounds or chemical constituents formed in the plant’s metabolic process. The chemicals are often referred as “secondary metabolites” of several classes (Batesmith, 1972).

Secondary metabolites promote the function of the immune system directly against the bacteria and viruses which reduce inflammation and are associated with treatment or prevention of cancer, cardiovascular disease and any other malady affecting the health or well being of an individual.
The term phytochemicals are used to refer to a broad spectrum of bioactive plant compound that are typically used in herbal preparation and variety of their nutrition supplements (Batesmith, 1972). Many phytochemicals are polyphenol anti oxidants that impart bright colors to fruits and vegetables. Lutein makes corn yellow, lycopene makes tomatoes red, and carotene makes carrots. Orange and anthocyanin makes blueberries blue. Both the bright colors and the antioxidant activities are due to alternating single-bonded and double-bonded carbons. The following are groups or families of related phytochemicals arranged by family. (http://en.wikipedia.org/wiki/phytochemical).

<table>
<thead>
<tr>
<th>Family</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavonoids</td>
<td>berries, herbs, vegetables.</td>
</tr>
<tr>
<td>Isoflavones [phyto estrogens]</td>
<td>soy, red clover, kudzuroot.</td>
</tr>
<tr>
<td>Isothiocyanins</td>
<td>Cruciferous vegetables.</td>
</tr>
<tr>
<td>Monoterpenes</td>
<td>citrus peels essential oils.</td>
</tr>
<tr>
<td>Organosulphur compounds</td>
<td>chives, garlic, onions.</td>
</tr>
<tr>
<td>Saponins</td>
<td>beans, cereals, herbs.</td>
</tr>
<tr>
<td>Phytosterols</td>
<td>vegetable oils.</td>
</tr>
</tbody>
</table>

There is abundant evidence from epidemiological studies that the photochemical in fruits and vegetables can significantly reduce the risk of cancer, probably due to poly phenol anti oxidant and anti inflammatory effects. But studies of supplementation with large doses of beta-carotene in smokers have shown an increase in cancer risk (possibly because excessive betacarotene results in breakdown products that reduce plasma vitamin A and Worsen the being cell proliferation induced by smoke). Many prechemical studies suggest that phytochemicals can prevent colorectal cancer or other cancers. For instance the chemoprevention database says more
than 250 studies have given phytochemicals significantly reduces the number of carcinogen-induced tumors in rats or mice.

In developing countries, plants are the main sources of medicine. According to World Health Organization, about 80% of the world people depend directly on plants for its medicinal values (Pareek, 1996). Yet many modern medicines are based on chemicals where as initially they are leached from natural sources. Thus, today’s health care system depends largely on plant products namely antioxidant enzymes, alkaloids, pigments etc. Usage of plant based remedies are wide spread which is non-toxic to our body systems. With the advancement of science and technology more and more specific are gaining prominence and angering greater importance in future.

The branch phytochemistry deals with the organic substance present on medicinal plants, their chemical structure, their biosynthesis turnover and metabolism. Phytochemicals are individual chemicals from which plants are made. Some plants contain compound with pharmacological activity (Finar, 2005). Phytochemical methods include separation, purification, and identification of many different constituents present in plant. One of the challenges of phytochemistry is to carry out all the above operations on small amount of materials (Kaufman et al., 1999).

Phytochemicals (from the Greek word phyto, means plant) are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients (Hasler and Blumberg, 1999). They protect plants from disease and damage and contribute to the plant’s color, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic
attack are called as phytochemicals (Gibson et al., 1998). Recently, it is known that they have played a great role in the protection of human health when their dietary intake is significant. More than 4,000 phytochemicals have been cataloged and are classified by protective function, physical and chemical characteristics (Meagher and Thomson, 1999).

In wide-ranging dietary phytochemicals are found in fruits, vegetables, legumes, whole grains, nuts, seeds, fungi, herbs and spices, Broccoli, cabbage, carrots, onions, garlic, whole wheat bread, tomatoes, grapes, cherries, strawberries, (Moorachian, 2000). Phytochemicals accumulate in different parts of the plants, such as in the roots, stems, leaves, flowers, fruits or seeds (Costa et al., 1999). Many phytochemicals, particularly the pigment molecules, are often concentrated in the outer layers of the various plant tissues. Levels vary from plant to plant depending upon the variety, processing, cooking and growing conditions (King and Young, 1999). Phytochemicals are also available in supplementary forms, but evidence is lacking that they provide the same health benefits as dietary phytochemicals.

These compounds are known as secondary plant metabolites and have biological properties such as antioxidant activity, antimicrobial effect, modulation of detoxification enzymes, stimulation of the immune system, decrease of platelet aggregation and modulation of hormone metabolism and anticancer property. There are more than thousand known and unknown phytochemicals. It is well-known that plants produce these chemicals to protect themselves, but recent researches demonstrate that many phytochemicals can also protect human against diseases (Narasinga Rao, 2003).
FIGURE: 1- Phytochemistries of Medicinal plants

Phytochemicals are not essential nutrients and are not required by the human body for sustaining life, but have important properties to prevent or to fight some common diseases. Many of these benefits suggest a possible role for phytochemicals in the prevention and treatment of disease, because of this property; many researches have been performed to reveal the beneficial health effects of phytochemicals. The purpose of the present review is to provide an overview of the extremely diverse phytochemicals present in medicinal plants.

Alkaloids are a group of naturally occurring chemical compounds, that contain mostly basic nitrogen atoms. This also includes some related compounds with neutral (Robert A. Meyes, 1979) and even weakly acidic properties (Leland J. Cseke 2006). Some synthetic compounds of similar structure are also attributed to alkaloids (William Johnson, 1999). In addition to carbon, hydrogen and nitrogen, alkaloids may also contain oxygen, sulphur and more rarely other elements such as chlorine, bromine, and phosphorus (Raj K Bansal, 2004).

Alkaloids have been reported in various plant parts such as in whole aerial plant [Clerodendron inerme [L.] Gaertn, Elephantopus scaber linn.], in leaves [Abrus percarious linn., Achyranthus asperalin], bark [Aguilaria agallocha Roxb.], in stem [Anacyclus Pyrethrum Dc.], in rhizomes and roots [Asparagus racemosus wild, curcuma longa linn.], in Flowering buds [Cassia fistula linn.] and in seeds [Are catechu linn., Calophyllum inophyllum linn.]. In plants alkaloids act as poisonous and stimulating agents. They also act as regulatory growth factors, reserve substances for nitrogen and other elemental supply and as end products of detoxification reaction. The alkaloids may have a role in the defense of
the plant against single oxygen [O₂], which is damaging all living organisms and is produced in plant tissues in the presence of light (Mohammed Ali, 2009).

Steroid occurs in animal oils and plant Oils and fats. They are crystalline compounds and contain an alcohol group. They occur as free or esters of higher fatty acids and are isolated from the unsaponifiable portion of oils and fats. Steroids obtained from plant sources are referred to as polyesters. Ergosterol and Stigmasterol are the principle plant steroids (Finar, 2005).

The largest group of plant secondary metabolites is the terpenes. Triterpenes are a major subgroup of the terpene superfamily (Xu et al., 2004). These compounds are low-molecular-weigh metabolites that are synthesized from mevalonate via 30-carbon intermediate, 2, 3-oxidosqualene. The cyclization of 2, 3-oxidosqualene by oxidosqualene cyclases (OSCs) to either tetracyclic sterols, through the activity of cycloartenol synthase or pentacyclic triterpenes, through the activity of enzymes such as â-amyrin synthase, â-amyrin synthase and lupeol synthase which represents a critical branch point between primary and secondary metabolism (Phillips et al., 2006).

Terpenes comprised one of the most important groups of active compound in plants with over 20, 00,000 known structures. All terpenoid structures may be divided into isoprene units (C₅H₈) containing two unsaturated bonds. During the formation of terpenes the isoprene units are linked in a head to tail fashion. Terpenes are generally represented by the formula (C₅H₈)n. Based on the values of n, terpenes are classified into Monoterpenes, Sesquiterpenes, Diterpenes, Triterpenes and Tetraterpenes. (Kaufman et al., 1999).

The term flavonoids are given to any compound; its structure is based on flavones. Flavonoids occur in the nature as Free State or as glycosides or associated with tannins.
Flowering plants, roots, barks, fruits and leaves are generally influenced by the perceived medicinal properties of plants and possess pigment in them (Bebber, 2007). It was realized that many of these pigments play a positive role in human health. Anthocyanins, betalains, carotenoids, flavonoids, polyphenolic constituents and chlorophyll are abundantly found in plant pigments which can be used in fields as natural food colouring but they act as antioxidants against free radical to support immune system and prevent diseases.

Food crops containing carotenoids, anthocyanins, chlorophyll and other flavonoids are “chemo preventers” by providing protection against certain forms of cancer and reduction, of cardiovascular diseases. The antioxidant properties of carotenoids may also protect human from carcinogens and heart disease.

Pigment also contains vitamin C, vitamin E, phenolic acid and organo sulphur compounds. Plant pigments show colour in specialized cells and are commercially used as food-coloring agent. They are also used as dietary, supplements (Nadakal, 2010).

The stem, roots and leaves of Varuna have great medicinal value. The plant is used internally as well as externally. Externally, the paste or its leaves or skin of bark is applied in cervical adenitis, abscess and edematous wounds. The same paste is salutary in rheumatic joint for relief of pain. The pulp of leaves is applied on abdomen in spleen enlargement, with great benefit.

Internally, Varuna is used in vast range of diseases. The decoction of leaves given along with ghee relieves flatulence and abdominal pain. It also works well as a laxative, cholegogue, appetizer and vermicide, hence useful in anorexia, tumors, liver disorders, flatulent dyspepsia and helminthiasis. The decoction of skin of Varuna is given along with honey in
abscesses for the potent anti inflammatory action. The decoction of skin of Varuna alone is used as blood purifier in gout, internal abscess and adenitis and to reduce body fat in obesity. The leaves cooked as vegetables are also benevolent in obesity. Varuna has the cardinal properties as litholytic, diuretic and urinary antiseptic. The decoction of bark skin or roots is beneficial in urinary calculi, dysuria and cystitis. The decoction of leaves effectively alleviates the fever and associated delirium. The fresh juices of its leaves are useful as bitter tonic. Varuna is used as a cholegogue, anthelmintic and anti-amoebic in both intestinal and hepatic.


The term inflammation is derived from the root word inflammabilis which means ‘to burn’. Classic inflammatory diseases such as rheumatoid arthritis, uveitis, asthma, and colitis hepatitis are major public health concern in the world (Cirino et al., 2003, Reiter et al., 2007, Emery et al., 2009). Pathophysiologically, inflammation is a series of well synchronized dynamic mechanism consisting of precise vascular, humoral and cellular events that is characterized by the extravasations of fluids, plasma and inflammatory leukocytes. An array of chemical mediators such as histamine, serotonin, leukotrienes, prostaglandins and oxygen derived from free radicals (O2-, OH, and ONOO-) are produced by inflammatory and phagocytic cells primarily in the sequence which contribute to the onset of inflammation (Tripathy and Grammas, 2009 and Safayhi and Sailer, 1997).

The inflammatory process may be defined as a sequence of events that occurs in response to noxious stimuli, infection or trauma (Calixto et al., 2004). The classic signs of inflammation are local redness, swelling, pain, heat and loss of function. The events of
inflammation that underline these manifestations are induced and regulated by a large number of chemical mediators, including kinins, eicosanoids, complement proteins, histamine and monokines (Percival, 1999).
GURE: 2 - Two Stages Of Inflammation: Acute inflammation is of short duration, where
chronic inflammation is a long- live inflammatory response.

Inflammation is the reactive state of hyperemia and exudation from blood vessels with consequent redness, heat, swelling and pain which a tissue manifests in response to physical or chemical injury or bacterial invasion. It is a tissue reaction by the body to injury and involves a complex array of enzyme activation, mediator release, extravasations of fluid, cell migration, tissue breakdown and repair. Three components of the inflammatory response have been distinguished and these may involve vasoactive substances chemotactic factors, degradative enzymes and superoxides and the neuropeptide, Substance P (Okoli et al., 2003).

Inflammation is a pathophysiological response to injury leading to the accumulation of various mediators like Prostaglandins, Histamines, 5-HT, Leukotrienes etc at the site of injury. Though it is a defense mechanism of the body, different events and complex mechanisms involve in it are responsible to maintain and aggravate much type of inflammatory disorders including Rheumatoid arthritis (RA) (Sosa et al., 2002). Inflammatory diseases are currently treated with steroidal and nonsteroidal anti-inflammatory drugs (NSAIDs) (Langman, 1998). Unfortunately, both of these widely prescribed drug classes have significant negative side effects, reducing their use in certain segments of the population (Juni et al., 2005). Hence, there is a need to develop new drugs with new modes of action that do not produce considerable side effects. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed (UNESCO, 1996). Natural product-based on anti-inflammatory agents with a transcriptional mode of action, good efficacy, and lower risk of side effects offer promising treatment and prevention of inflammation-related conditions.
Infectious diseases are the leading cause of death world-wide. Antibiotic resistance has become a global concern. The clinical efficacy of many existing antibiotics is being threatened by the emergence of multi drug resistant pathogens. Many infectious diseases have been known to be treated with herbal remedies throughout the history of mankind. Therefore, researchers are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs against microbial infections. There is a continuous and urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases. The potential for developing antimicrobials from higher plants appear rewarding as it will lead to the development of a phytomedicines to act against microbes (Parekh and Chanda, 2006).

Unlike modern allopathic drugs which are single active components that target one specific pathway, herbal medicines work in a way that depends on an orchestral approach. A plant contains a multitude of different molecules that act synergistically on targeted elements of the complex cellular pathway (Durmowicz and Stenmark, 1999).

Medicinal plants have been a source of wide variety of biologically active compounds for many centuries and used extensively as crude material or as pure compounds for treating various disease conditions (Arif, 2009). The widespread use of herbal remedies and healthcare preparations, as those described in ancient texts such as the Vedas and the Bible and obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties (Dasilva, 1999).
The use of herbal medicine gains popularity due to toxicity and side effects of allopathic medicines. Medicinal plants play an important role in the development of potent therapeutic agents. There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications (Verma and Singh, 2008). India with its biggest repository of medicinal plants in the world may maintain an important position in the production of raw materials either directly for crude drugs or as the bioactive compounds in the formulation of pharmaceutical’s cosmetics etc; (Tiwari, 2008). Ayurveda literally means the "Science of life and longevity" in ancient Sanskrit is one of the oldest healing system of India, based on lifestyle diet and herbs (Gupta and Shaw, 2009 and Shah et al., 2010). Natural products with anti-inflammatory activity have long been used as a folk remedy for inflammatory conditions such as fevers, pain, migraine and arthritis. As the inflammatory basis of disease becomes clear, anti-inflammatory food and food products create greater interests (Yuan et al., 2006).

Over the past decades, the prevalence of atopic dermatitis and allergic or irritant contact dermatitis has been increasing significant in the general population, causing considerable economic costs and decreased quality of life (Gates, 2007). Topical corticosteroids have been the first-choice therapy for treatment of these inflammatory skin diseases such as eczema, atopic and seborrheic dermatitis, and psoriasis. While effective in many patients, this form of therapy carry the concern of local and systemic adverse effects and may induce skin atrophy, especially after long-term use (Abramovits et al., 2006). Triterpenoids represent a very large class of plant secondary metabolites which have been demonstrated to exhibit a variety of biological activities including anti-inflammatory activities (Ryu et al., 2000).
Lupeol, a pentacyclic triterpene, is a biologically active constituent that has received much attention due to its wide spectrum of medicinal properties that include strong antiinflammatory effects (Ward, 2001).

Lupeol was investigated for its anti-inflammatory activity under in vitro and in vivo conditions (Ashalatha et al., 2010). Using multiple different inflammation-associated mouse models, several studies led to the idea that the anti-inflammatory potential of lupeol is very important (Lima et al., 2007). Lupeol application with therapeutic intention has been shown to diminish the inflammation in mouse models of arthritis and bronchial asthma. Comparative studies performed in the case of inflammation rodent models revealed that the antiinflammatory activity of lupeol is higher than indomethacin, dexamethasone or various anti-inflammatory phytochemicals (Vasconcelos, 2008).

NSAIDs are among the most commonly used drugs worldwide. They are prescribed for orthopaedic conditions such as osteoarthritis, soft-tissue injuries and fractures etc (Boursinos et al., 2009). NSAIDs are one of the best classes of drugs to prevent and treat postoperative pain (Luna et al., 2007). The greatest disadvantage in presently available potent synthetic drugs lies in their toxicity and reappearance of symptoms after discontinuation. Therefore, the screening and development of drugs for their anti-inflammatory activity is the need of hour and there are many efforts for finding anti-inflammatory drugs from indigenous medicinal plants (Srinivasan et al., 2001). The use of NSAIDs is associated with many side
effects, but their unwanted effects on the gastrointestinal tract, the kidney and the cardiovascular system are considered as major issues with the use of these drugs (Dumitrescu, 2010).

Plant based antimicrobials represent a vast untapped source of medicines and further exploration of plant antimicrobials are also in need to occur. Antimicrobials of plant origin have enormous therapeutic potential (Iwu et al., 1999).

The medicinal value of *Crataeva nurvala* has been described against a wide variety of urinary disorders including urolithiasis, in the ancient text “Sushruta Samhita” (Brisha Granta, 1981). Among the compounds isolated from the stem bark, lupeol was identified as a major component in association with α- and β-amyrin (Prabhakar and Sureshkumar, 1990).
FIGURE: 3 - Pathogenesis of Urinary tract infection

Many plants with such medicinal properties are abandoned and seem to be underutilized hence, this study was undertaken with the following objective.

- This research work has been done to evaluate the ethnomedical and trible medical information relating to the remedy of various anti-inflammatory disorders and analgesic by suitable experimental animal models.
- The work also supports the various phytoconstituents responsible for the above activity which was identified by suitable qualitative phytochemical analysis and TLC profile.
- The selection of medicinal plant like *Crataeva religiosa* was based on the wild availability in wide agroclimatic conditions with medicinal value recorded as folklore information.

2.0 REVIEW OF LITERATURE

Man’s interest in plants primarily goes back to time immemorial of the early civilization. Man was dependent on plants for his basic needs like food, shelter and clothing. Plants play an important role as fulcrum in any ecosystem and also contribute to the welfare of mankind by providing fuel, fibre, food, timber, medicine, etc. At the sametime man has derived the greatest