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Nature has been a major source for various medicinal plants which are being used in traditional medicinal practice (Sastry, 1952; Mithraja et al., 2012; Zainuddin and Sulain, 2015). Since, time immemorial human beings have been using various parts of medicinal plants in the treatment of various ailments (Tanaka et al., 2002). Natural products from plants have been the basis of the treatment of human diseases such as infections, lipid disorder, cancer, immunomodulation for organ transplant, respiratory disorders, leprosy and have antidiabetic, antiviral, antifungal, antibacterial, antiseptic, anti-inflammatory and antipyretic effects. Herbal medicine is currently in demand and its recognition in medicine is increasing day by day due to toxicity and side effects of allopathic medicines, which has led to sudden increase in the number of herbal drug manufacturers (Agarwal, 2005). The ancient indigenous systems such as Siddha, Ayurveda, Unani and Allopathy use several plant species to treat different ailments (Rabe and Van Staden, 1997). It has been estimated that around 25,000 effective plant-based formulations used in folk medicines are known to rural people in India. At the same time the market for ayurvedic medicines is estimated to be expanding at 20% annually (Verma and Singh, 2008).

India is the 12th Mega-Biodiversity country of the world with two hot-spots namely Eastern Himalayas and Western Ghats (Rath, 2005). Western Ghats has a vast repository of plants that are used in traditional medical treatments which is of great importance to the human health and still many of them are yet to be investigated for their medicinal values (Kirtikar and Basu, 1995). From ancient times different parts of medicinal plants are used for the treatment and curing of various diseases (Chah et al., 2006). Most of the drugs derived from plants are effective against many diseases and for this many of the chemical constituents present in the plants should be isolated (Fabricant and Farnsworth, 2001). About 25 per cent of drugs in developing countries depend on the derivatives of plants, which are mainly used by rural people from many years (Gurib-Fakim, 2006).

Phytochemicals of plants and their medicinal values

Plants contain various metabolites which are divided into primary metabolites such as carbohydrates, proteins and peptides. In addition, smaller molecules namely secondary metabolites like alkaloids, tannins, saponins, flavonoids, phenolic
compounds, glycosides, triterpenes, sterols etc. are also present. These secondary metabolites are responsible for the pharmacological activity of plants and are present in less quantity when compared to primary metabolites that are derived from primary metabolites (Buchanan et al., 2000).

Synthesis of secondary metabolites occurs by the following pathways (Heldt, 2005):

1. The shikimic acid pathway - alkaloids, phenols, flavonoids, tannins, lignins, coumarins and many aromatics.
2. The acetate malonate pathway - phospholipids, glycolipids, glycerides, waxes and fatty acids and
3. The acetate mevalonate pathway - sesquiterpenes and sterols.

The medicinal value of the plants lies in some naturally occurring chemical constituents or substances that produce a definite physiological action on the human body (Krishnaraju et al., 2005; Vougat et al., 2015). Medicinal plants with therapeutic properties are used for the treatment of many infectious diseases of humans as they contain many bioactive constituents which are of curative effects and are termed as phytococonstituents or phytochemicals (Balandrin et al., 1985; Sanaa et al., 2012; Balasubramanian et al., 2014). The most important bioactive constituents of plants are secondary metabolites which induce different biological activities including antioxidant, anti-inflammatory, antimicrobial, antibiotic, hormonal and insecticidal properties (Heldt, 2005; Loizzo et al., 2007; Krimat et al., 2015). Most of the time these secondary metabolites synthesized in plants protect them from insect and microbial attack (Heldt, 2005). However, the secondary metabolites are of great medicinal values that have a vast range of biological activity. In ancient times substances obtained from plants and animals with or without purification were employed as medicine.

Many higher plants are used as a source of new drugs and the reason behind this is unexplored (Mahesh and Satish, 2008). Different plant parts such as root, stem, flower, fruit and whole plant have varied active compounds and medicinal properties (Harborne, 2006) with a wide range of therapeutic and antimicrobial properties against many serious diseases (Sashikumar et al., 2003). Thus, it is anticipated that phytochemicals with adequate biological activity could be used for the treatment of microbial infections (Parekh and Chanda, 2007). Advancement in phytochemical analysis has led to the improvement of active and actual process of investigating the
plants for peculiar constituents (Banso, 2009) with particular mechanism of action and chemical structures (Anand et al., 2011).

Antimicrobial agents

Many infectious diseases caused by bacteria *viz.*, *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhimurium* and many more have lead to the increased fatality which has become a major problem in developing countries (Mulligen et al., 1993). Another major problem that world population is facing is that the pathogens are becoming drug resistant (Okeke et al., 2005; Syed et al., 2011; Khan et al., 2014). Hence, many of the diseases cannot be cured (Cos et al., 2006) and sometimes these drugs cause side effects to humans such as allergic reactions, hypersensitivity and others (Lopez et al., 2001).

Since from prehistoric period the plants are used to treat many diseases and are very curative (Sofowora, 1986). Hence, the plants are screened for isolation of biologically active compounds which act as antimicrobial, antioxidant, anti-inflammatory, antidiabetic, anticancerous agents etc. (Altuner et al., 2010). Plant derived drugs namely isoquinoline alkaloid emetine, which is an amoebicidal drug extracted from *Cephaelis ipecacuanha* to avoid infection spread by *Escherichia histolytica*. Quinine and chloroquine alkaloid of bark on cinchona tree used for treatment of malaria and antileukaemic alkaloids- vinblastine and vincristine extracted from *Catharanthus roseus* are used in cancer treatment (Nelson, 1982). Many of the microbes are used for the discovery of antibiotics such as penicillin, chloromycetin, aureomycin and streptomycin (Trease and Evans, 1972).

Antioxidants

Reactive oxygen species such as free radicals derived from the product of oxidation reactions are essential for the functioning of human body. If produced in large quantity it attacks and induces oxidative damage to lipids, proteins, lipo-proteins and DNA, which leads to human diseases and disorders such as diabetes, atherosclerosis, inflammation, ageing, immunosuppression, cancer, malaria, HIV/AIDS, stroke, Parkinson’s disease, Alzheimer’s disease, hair loss and heart disease (Kim et al., 2010). Phenolic components such as flavonoids (Pietta, 1998) and phenolic acids (Shahidi et al., 1992) are responsible for antioxidative effect by
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Chelating metal ions, improve antioxidant endogenous system and prevent radical formation (Al-Azzawie and Mohamed-Saiel, 2006). Flavonoids have health promoting factors and anti-cancer, anti-allergic, antiviral, antibacterial, antimutagenic, antineoplastic, antithrombotic, vasodilatory and anti-inflammatory activities (Heldt, 2005). Now-a-days, there is a great scientific interest in secondary metabolites produced from plants, due to the increasing development of resistance pattern of microorganisms to most currently used antimicrobial drugs (Abdallah et al., 2012). Antioxidants derived from plants generally contain, the phenolics which have many biological activities such as anti-inflammatory, anti-cancer and anti-microbial (Gambhire et al., 2009; Mirzaei et al., 2013; Prabakar et al., 2015) and are very important in controlling many human diseases (Baruah and Barua, 2010). Plants also have the capability to safeguard the human body from oxidative damage by scavenging the free radicals and inhibiting peroxidation and other radical mediated processes (Asiedu-Gyekye et al., 2012). Plant derived antioxidants are important in research, dietary, cosmetic and pharmaceutical areas (Suhaj, 2006), nutraceutical and functional foods (Espin et al., 2007) which are economic, safe and effective when compared to synthetic ones which are carcinogenic (Tadhani et al., 2007). The most common method used for screening the antioxidants in plant extracts and foods is 2,2-diphenyl-1-picyrylhydrazyl (DPPH) and the radical scavenging activity (RSA). The scavenging activity of plant extracts can be obtained by trapping the stable radical due to this absorbance decreases (Sultanova et al., 2001). A remarkable number of modern drugs have been isolated from medicinal plants which have led to sudden increase in the number of herbal drug (Alagesabooopathi and Sivakumar, 2011).

![Degenerative Cascade](image)

**Fig. 1:** Protective effect of plants against degenerative diseases (Source: Guha et al., 2009)
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About 35,000 plant species are used as a source of medicines and accounts for about 25-50% of modern day medicines (Philip et al., 2009; Upadhyay et al., 2011). These plants are used as a source of therapeutic agents due to lesser side effects (Nagumanthri et al., 2012). Advancement in phytochemistry has led to the identification and isolation of compounds, which are useful in disease treatment (Joshi et al., 2009). Hence, demand for plant-derived drugs have increased and accordingly the global-market rate has gone up to more than 20 billion annually (Lin et al., 2013).

Solvent extraction

Solvent extraction is a process used to extract phytochemicals/compounds from plants, bacteria, fungi, microalgae, algae, soil sediments and polymers. Most commonly used solvents for extraction process include hexane, petroleum ether, chloroform, benzene, ethyl acetate, methanol, ethanol and distilled water (Plaza et al., 2010). Above organic solvents can be used for the extraction of both polar and non-polar organic compounds such as alkaloids, tannins, saponins, phenols, flavonoids, sterols, triterpenes, proteins, oils, etc. (Szentmihalyi et al., 2002; Plaza et al., 2010). Compared to other methods of extraction, solvent extraction is easier to operate and also processing cost is low. In order to obtain better yields, this method is further improved by other methods such as soxhlet, microwave and ultrasound extraction (Szentmihalyi et al., 2002).

Parasitic Angiosperms

Plants are autotrophs and produce their own carbon sources through photosynthesis. But parasitic angiosperms derive carbon from sources other than their own photosynthesis hence heterotrophic. The word Parasite is a Greek word which literally means "beside the food", where para means beside and sitos means grain or food (Nickrent and Musselman, 2004). These parasitic flowering plants directly attach to host plants via haustoria which are modified roots that form morphological and physiological link between the parasite and host. Through these haustoria they draw their nutrients (Kuijt, 1969). They can attack a large number of hosts and have been proved to be fatal to various horticultural, ornamental, agricultural and commercial crops (Kuijt, 1969). The degree of damage varies with the species, its longevity and intensity of parasitism. Furthermore, a number of these parasites
especially the members of Loranthaceae and Viscaceae (Mistletoes) profoundly alter their hosts’ physiology resulting in crop failure. It has been estimated that about 1% of flowering plants approximately 4,100 species are parasitic angiosperms belonging to 277 genera under 18 different families (Nickrent and Musselman, 2004).

Watson (2001) has proposed that mistletoes function as key stone resources in many ecosystems and are important ecological components that positively affect diversity in their habitats. Mistletoes are taxonomically diverse group of plant parasites found in five families: Loranthaceae, Viscaceae, Misodendraceae, Eremolepidaceae and Santalaceae (Restrepo et al., 2002). Mistletoes parasitize thousands of vascular plant species world-wide (Kuijt, 1969). Most of them are stem hemiparasites capable of photosynthesis, but dependent on their host for water (Calder and Bernhardt, 1983) and their seeds are dispersed by birds (Restrepo et al., 2002).

The members of both Loranthaceae and Viscaceae are commonly known as mistletoes. The anglo-saxon word misteltan is derived from the old German word ‘mist’ for dung and “tan” meaning twig (Calder and Bernhardt, 1983). This is an apropos name given that birds defecate the seeds of mistletoes to tree branches. Most mistletoes are woody shrubs, often with brittle stem and leaves. The family Loranthaceae consists of about 75 genera and 1000 species (Calvin and Wilson, 2006) of woody plants, all of them are hemi-parasites except three root parasites (Nuytsia, Gaiadendron and Atkinsonia). About 30 genera occur on introduced or cultivated trees.

These parasitic flowering plants have been the subject of intensive research in recent decades not only as objects of intrinsic botanical and physiological interest but also because of increased awareness of their importance as pests of agriculture, horticulture, forestry and plants of medicinal values (Parker and Riches, 1993). Most of the studies in parasitic angiosperms concerned about their physiology but they have not been investigated properly from the point of their phytochemistry. Since they are dependent on their hosts for water and mineral nutrients, the host’s phytochemical constituents might have influence on the parasitic angiosperms. Hence, an investigation was undertaken to know more on these biologically specialized parasitic flowering plants for phytochemicals and their biological activities in three different chapters.