Introduction

For thousands of years, natural plants have played an important role throughout the world in treating and preventing human diseases (Chin et al., 2006). An analysis of the origin of the drugs developed between 1981 and 2002 showed that natural products or natural plant derived drugs comprised of 28% of all new chemical entities (NCEs) launched (Newman et al., 2003). In addition, 24% of these NCEs were synthetic or natural mimic compounds, based on the study of pharmacophores related to natural products (Newman et al., 2000). This combined percentage (52 % of all NCEs) suggests that natural plants are important sources for new drugs and are also good lead compounds suitable for further modification during drug development. The large proportion of natural products in drug discovery has stemmed from the diverse structures and the intricate carbon skeletons of natural products. Since secondary metabolites from natural sources have elaborated within living systems, they are often perceived as showing more “drug-likeness and biological friendliness than totally synthetic molecules,” (Koehn and Carter, 2005), making them good candidate for further drug development (Balunas and Kinghorn, 2005; Drahl et al., 2005).

Vascular plants are able to synthesize a multitude organic molecules/phytochemicals, referred as “secondary metabolites” (Harborne, 1982; 1984). These molecules are involved in a variety of roles in the life span of plants, ranging from structural ones to protection. They are natural products that often have an ecological role in regulating the interactions between plants and their environment. Secondary metabolites can be defensive substances, such as phytoalexins and phytoanticipins, anti-feedants, attractants and pheromones (Hanson, 2003). The importance of plant secondary metabolites in medicine, agriculture and industry has led to numerous studies on the synthesis, biosynthesis and biological activity of these substances. It has been estimated that over 40% of medicines have their origins in these active natural products (Gershenzon and Kreis, 1999). Phenolic compounds are regarded as one such group that are synthesized by plants during development and in response to conditions such as infection, wounding, UV radiation, etc, exist widely in plant kingdom (Harborne, 1982;
Pridham, 1960; Shahidi and Naczk, 2004; Backman, 2004). The term phenolic compounds include a wide range of plant substances possessing an aromatic ring with at least one hydroxyl substitute, i.e. a phenol (Croteau et al., 2000)). They show considerable diversity and may be divided into several different classes of compounds. Approximately 8000 naturally occurring compounds belong to the category of “phenolics”, flavanoids forming the largest group among them. Monocyclic acids (benzoic acid and cinnamic acid derivatives) are the simplest derivatives of this class of compounds. More complex derivatives are formed from these simple derivatives by the addition of sugar chain and/or different metabolic reactions. Thus, the term “plant phenolics” encompasses simple phenols, phenolic acids, coumarins, and flavonoids, stilbenes, up to hydrolysable and condensed tannins, lignans and lignins. Phenylpropanoids (anthocyanin, flavanoids, flavanols and flavonols) phenolics quinines, found in food are important group of phenolics. The biosynthetic part of plant phenols has aromatic amino acid L- phenylalanine, a three step sequence knows as Phenylpropanoid metabolism.

Phenolic compounds form the structural components of the plants and contribute to flavor, color and sensory properties (bitterness, astringency) of food. They have distinct physiological properties and have important role as defense compounds. Being UV absorber due to chromophores, they protect plants from harmful UV radiation. Although the exact contribution of phenolic compounds is still not clear, they are known to be important in survival of plants in its environment. Antioxidant and antimicrobial properties (antifungal, antibacterial, antiviral and antiprotozoal) of phenolic compounds are well established. Several plant derived drugs used for curing or preventing diseases are rich in phenolic compounds.

Tannins are a chemically diverse group of water soluble phenolics which bind proteins to form soluble or insoluble complexes (Bate-Smith and Swain 1962, Hagerman 1989). According to chemical structure tannins are divided into two classes: condensed and hydrolysable tannins (Hagerman and Butler, 1989). Condensed tannins which are also called as proanthocyanidins are flavonoid polymer and can be oxidatively degraded
in mild acid to yield anthocyanidins (Porter et al. 1986). Hydrolysable tannins are esters and can be easily hydrolysed to give gallic acid or hexahydroxydiphenic acid and the parent glucose or other polyols (Haslam, 1979). The gallotannins are simple esters of gallic acid, and may contain up to five galloyl groups esterified directly to the polyol (mono-, di-, ...pentagalloyl glucose), and additional galloyl groups esterified to the core galloyl groups (hexa-, heptagalloyl glucose).

The phenolics are normally complex organic substances, which contain more than one phenolic group. Polyphenolics can be divided into many different subcategories, such as flavonoids and non-flavonoid components. Anthocyanins are subgroup of plant constituents known as flavonoids (Markakis, 1982). They occur in all higher plants, mostly flowers in fruits but also in leaves, stems and roots. Anthocyanins are plant pigments which are responsible for red, blue and purple colors of many fruits, vegetables and flowers. Anthocyanins are getting increased important as antioxidant properties and health benefits, including anticancer, anti-inflammatory and vasoprotective effects, preventing coronary heart diseases and improving visual acuity (Guisti and Wrostad, 2001; Stintzing et al., 2002; Chaovanalikit et al., 2003; Joniec et al., 2003; Kahkonen et l., 2005; Gomez-Plaza et al., 2006; Prata and Oliveira, 2007)

One of the plant, rich in phenolics is Terminalia Chebula Retz., belongs to the family Combretaceae. T. chebula is a medium to large sized deciduous tree which grows up to 20 m tall and 1 – 1.5 m in girth (Kanan et al., 2009). The plant is a native of Asia and grows in Nepal, Sri Lanka, Myanmar, Bangladesh, Egypt, Iran, and Turkey and also in Pakistan, Yunnan, Tibet, China (Hongbo et al., 2010). In India it grows in deciduous forests of Himachal Pradesh, Tamil Nadu, Kerala, Karnataka, Uttar Pradesh, Andhra Pradesh and West Bengal. It is capable of growing in different range of soils.

The plant is used for the treatment of constipation, diarrhea, ulcers, gastro-enteritis, asthma, cough, dyspnea, dyspepsia, hemorrhoids, candidiasis, parasites, malabsorption syndrome, hepatomegaly, vesicular and renal calculi, urinary discharges, tumors, skin diseases, leprosy, intermittent fever, rheumatism, arthritis, gout, neuropathy,
paralysis, memory loss, epilepsy, depression, diabetes, cardiovascular diseases, anorexia, wounds (Raju et al., 2004). *T. chebula* is a popular traditional medicine not only used in India but also in other countries of Asia and Africa. Studies revealed that the herb is used as a laxative and it has homeostatic, diuretic and cardiotonic activities (Ammar et al., 2002). It is also used to treat digestive disorders, coronary diseases, allergy and infectious disease like cough, fever and skin diseases (Bharat et al., 2009).

The active principle constituents of *T. chebula* are gallic acid, ellagic acid, tannic acid, ethyl gallate, chebulagic acid, chebulinic acid, corilagin, beta-sitosterol, terchebulin, caffeic acid, mannitol, anthraquinones, ethaedioic acid, terpinene, terpinenol, etc (Kim et al., 2006; Saleem et al., 2002; Xie et al., 2006). In a recent study, *T. chebula* was confirmed to have more phenolics than the other plant extracts (Ammar et al., 2002). In *T. chebula*, 33% of the total phytoconstituents are hydrolysable tannins (which may vary from 20-50%) and are responsible for pharmacological activity. These tannins contain phenolic carboxylic acid like gallic acid, ellagic acid, chebulic acid and gallotannins such as 1,6 di-0-galloyl-β-D glucose, 3,4,6 tri-O-galloyl-β-D-glucose, 2,3,4,6 tetra-O-galloyl-β-D-glucose, 1,2,3,4,6 penta-O-galloyl-β-D-glucose. Ellagitanin such as punacalagin, casuarinin, corilagin and terchebulin and others such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid reported in literature (Juang et al, 2004; Han et al, 2006).

The indigenous medicinal plant *Saraca asoca* (Roxb.) De Wilde or *Saraca indica* Linn., belongs to *Caesalpiniaeae* subfamily of *Legume* family. It has been in extensive use in Ayurvedic and Unani system of medicine for a variety of ailments. Its use in the treatment of menstrual disorder, especially in condition of menorrhagia, attracted the attention of modern investigators since a long time (Sen, 1963). It is a very handsome, small, erect evergreen tree; with deep green leaves growing in dense clusters. It is distributed in evergreen forests of India up to an altitude of about 750 meters. It is found throughout India, especially in Himalaya, Kerala, Bengal and whole south region. Bark is rusty brown to grey, channeled, varying in length, 2 to 4 cm in width and 5 to 8 mm in thickness (Quality standards of Indian Medicinal Plants, 2005). The bark of the herb is
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Strongly astringent and uterine sedative but odor not specific. It acts directly on the muscular fibers of the uterus. It has a stimulating effect on the endometrium and the ovarian tissue (Debnath et al., 2010). It is also used in metrohagia, menorrhagia, chronic lymphadenitis and inflammation (Khare, 2007).

S. asoca is a very important medicinal plant due to its well-known ethnopharmacological uses. A recent research has explored other useful activities of S. asoca. Chemoprevention of skin cancer by the flavonoid fraction of S. asoca flower has been found (Cibin, et al., 2010). Potential anticancer activity of S. asoca extracts towards transplantable tumors in mice has also been reported by some other researchers (Varghese, et al., 1992). In another study, In vitro examination of bark extract from S. asoca has shown cytotoxic activity (Teunis, et al., 1986). Phytochemical study shows that bark contains tannins, proanthocyanidins, and leucoanthocyanidins along with lignan glycoside, flavonoids and sterols (Indrani and Balasubramanian, 1985; Middelkoop and Labadie, 1985; Duggal and Misra, 1980; Sadhu et al., 2007).

Unprecedented demand for raw materials of herbal drugs, which are mostly collected from wild sources, has led to adulteration and substitution of genuine drug. Stem bark of S. asoca is a major drug in famous herbal preparation “Ashoka” (The Ayurvedic Pharmacopoeia of India, 1986). This preparation is reported as astringent, refrigerant, alexiteric, anthelmintic, demulcent and emollient and also employed in treatment of dyspepsia, enlargement of abdomen, colic, piles, ulcers, and is considered as an important indigenous drug for the treatment of various female diseases especially menorrhagia (Kirtikar and Basu, 2001; Chopra et al., 2001). One of the adulterant of “Ashoka” is bark of Polyathia longifolia.

P. longifolia (Family: Annonaceae) is an ornamental tree, native to the drier region of India and commonly cultivated in India, Pakistan and Sri Lanka (Sastri, 1969). Almost all parts of the plant are used in the Indian traditional system of medicine for the treatment of various ailments in human beings. In Ayurveda, particularly, the bark of P. longifolia has significant medicinal properties (Katkar et al., 2010). The bark is bitter,
acrid, cooling, febrifuge, and anthelminthic. It is useful in fever, skin disease, diabetes, hypertension, helminthiasis, and vitiated conditions of vata and pitta (Anonymous, 1985).