



Preliminary Phytochemical Screening Of Some Important Medicinal Plants

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Traditional medicine also known as indigenous or folk medicine comprises medical knowledge systems that developed over generations within various societies before the era of modern medicine. Traditional medicines are prepared from a single plant or combination of more than one plant. Indian contribution to herbal market and emphasis on novel research is continuously increasing. Phytochemical constituents are responsible for medicinal activity of plant species. Hence in the present study preliminary phytochemical screening of some important medicinal plants was carried out, qualitative phytochemical analysis of these plants confirm the presence of various secondary metabolites like saponins, triterpenoids, steroids, anthraquinones, coumarins, fatty acids, tannins, lignins, leucoanthocyanins, emodins, alkaloids, glycosides, flavonoids and phenols. The results suggest that the phytochemical properties for curing various ailments and possess potential anti-inflammatory, antimicrobial and antioxidant and leads to the isolation of new and novel compounds.

Key words: Medicinal plants, phytochemical screening, lignins, flavonoids, phenols, secondary metabolites.

INTRODUCTION

Medicinal plants are the richest bio-resources of folk medicines and traditional systems of medicine; and food supplements, nutraceuticals, pharmaceutical industries and chemical entities for synthetic drugs (Ncube *et al.*, 2008). Modern medicine has evolved from folk medicine and traditional system only after through chemical and pharmaceutical screening (Boopathi and Sivakumar, 2011). India is the birth place of renewed system of indigenous medicine such as Siddha, Ayurvedha and Unani. Traditional systems of medicines are prepared from a single plant or combinations of number of plants. The efficacy depends on the use of proper plant part and its biological potency which in turn depends upon the presence of required quantity and nature of secondary metabolite in a raw drug (Vinoth *et al.*, 2011; Savithramma *et al.*, 2010). Herbal medicines have become more popular in the treatment of many diseases due to popular belief that green medicine is safe, easily available and with less side effects (Savithramma *et al.*, 2011).

Phytochemicals are responsible for medicinal activity of plants (Savithramma *et al.*, 2011), these are non-nutritive chemicals that have protected human from various diseases. Phytochemicals are basically divided into two groups that is primary and secondary metabolites based on the function in plant metabolism. Primary metabolites are comprise common carbohydrates, amino acids, proteins and chlorophylls while secondary metabolites consist of alkaloids, saponins, steroids, flavonoids, tannins and so on (Jigna and Sumitra, 2007; Kumar *et al.*, 2009). Phytochemical constituents are the basic source for the establishment of several pharmaceutical industries. The constituents are playing a significant role in the identification of crude drugs (Savithramma *et al.*, 2011). Recently number of plants were screened for secondary metabolites for their medicinal values *Svensonia hyderabadensis* (Lingarao and Savithramma, 2011), *Boswellia ovalifoliolata* (Savithramma *et al.*, 2010), *Dysophylla myosuroides* and *Talinum cuneifolium* (Savithramma *et al.*, 2011), *Memecylon umbellatum* (Krishnamurthy and Asha, 2010), *Naringi crenulata* (Sampathkumar and Ramakrishna, 2011), *Momordica charantia* (Santhi *et al.*, 2011), *Andrographis neesiana* (Boopathi and

Sivakumar, 2011), *Indigofera heterantha* (Uddin *et al.*, 2011), *Dalbergia sisso* (Mohanthy *et al.*, 2011) and *Cephalotaxus koreana* (Bae *et al.*, 2007). In this order we are studied, qualitative preliminary phytochemical analysis in 21 traditionally used medicinal plants.

MATERIAL AND METHODS

Collection and identification of Plant material

The plant samples were collected from Tirumala hills and different locations of Chittoor District. Taxonomic identification of the plants were carried out with the help of Gamble (1957) and also compared with the herbarium present in the Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh, India.

Sampling of plant material

Fresh leaves of 21 different plant species free from diseases were collected during the month of May, 2011. The leaves were washed thoroughly 2-3 times with running tap water, leaf material was then air dried under shade. The plant material was grinded and powders were kept in small plastic bags with paper labeling.

Preparation of extract

The grinded leaf materials of 5g weighed separately using an electronic balance and were crushed in 25 ml of sterile water, boiled at 50-60°C for 30 minutes on water bath and it was filtered through Whatman No.1 filter paper. Then filtrate was centrifuged at 2500 rpm for 15 minutes and filtrate was stored in sterile bottles at 5°C for further use (Harbone, 1973).

Phytochemical screening

The condensed extracts were used for preliminary screening of phytochemicals such as steroids, alkaloids, lignin and phenols (Gibbs, 1974); fatty acids, glycosides, triterpenoids and saponins (Ayoola *et al.*, 2008); tannins, leucoanthocyanins and emodins (Treare and Evan, 1985); reducing sugars (Satyanarayana, 1999); anthraquinones (ASEAN, 1993), flavonoids (Peach and Tracey, 1956) and coumarins (Rizk, 1982).

Table 1: Phytochemical screening for secondary metabolites of medicinal plants

S. No.	Family Name	Name of the plant species	A l	A n	C o	E m	F a	Fl	G l	L e	Li	P h	R e	S a	S t	T a	T i
1.	Acanthaceae	<i>Andrographis echioides</i> (L.) Nees	+	-	-	-	-	+	-	-	+	+	-	-	-	+	+
2.	Alangiaceae	<i>Alangium salvifolium</i> (L.f) Wang.	+	-	+	-	+	+	-	+	+	+	++	+	-	+	+
3.	Amaranthaceae	<i>Gomphrena serrata</i> L.	-	+	-	-	+	+	+	-	+	++	+	-	-	+	-
4.	Apocynaceae	<i>Allamanda cathartica</i> L.	-	-	-	-	-	+	+	+	+	++	++	-	-	+	-
		<i>Carissa spinarum</i> L.	-	+	-	+	-	-	+	-	+	+	+	+	-	+	+
5.	Asclepiadaceae	<i>Caralluma</i>	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-

	e	<i>attenuata</i> Wt.																
		<i>Ceropegia tuberosa</i> Roxb.	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
		<i>Pergularia daemia</i> (Forsk.)	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-
6.	Asteraceae	<i>Chrysanthemum indicum</i> L.	-	+	+	+	-	+	+	-	-	+	+	-	+	+	-	
7.	Bignoniaceae	<i>Tabebuia pentaphylla</i> Hemsl.	-	-	-	-	-	+	-	-	+	+	-	-	-	+	-	
8.	Cucurbitaceae	<i>Coccinia grandis</i> L.	-	-	-	-	-	+	-	+	+	+	-	-	-	+	-	
		<i>Cucumis melo</i> L.	-	-	-	+	-	+	-	+	+	+	+	-	-	+	+	
		<i>Zehneria maysorensis</i> (Wt. & Arn.) Arn.	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-
9.	Euphorbiaceae	<i>Tragia involucrata</i> L.	-	+	+	+	-	-	-	-	+	+	+	+	+	+	+	
10.	Loranthaceae	<i>Taxillus heyneanus</i> Schult. Danser.	-	-	-	-	+	+	-	-	+	++	+	-	-	+	+	
11.	Lythraceae	<i>Lagerstroemia reginae</i> Roxb.	+	+	-	+	-	+	-	-	+	+	-	+	-	+	-	
12.	Martyniaceae	<i>Martynia annua</i> L.	+	+	-	-	-	+	-	-	+	+	-	-	-	+	-	
13.	Nyctanthaceae	<i>Nyctanthes arbortristis</i> L.	-	+	-	-	-	+	+	-	+	+	-	-	+	+	-	
14.	Rubiaceae	<i>Anthocephalus cadamba</i> L.	-	+	+	+	+	+	-	+	+	+	+	+	-	-	-	
		<i>Ixora arborea</i> Roxb.	-	-	-	-	-	+	-	+	+	+	+	-	-	+	-	
15.	Sapotaceae	<i>Mimusops elengi</i> L.	+	+	-	-	-	+	-	-	+	+	+	-	-	+	-	

Note: Al – Alkaloids, An-Antraquinons, Co-Coumarins, Em-Emodins, Fa-Fatty acids, Fl-Flavonoids, Gl-Glycosides, Le-Leucoanthocyanins, Li-Lignins, Ph-Phenols, Re-Reducing sugars, Sa-Saponins, St-Steroids, Ta-Tannins, Ti-Triterpenoids, ‘++’ indicates more, ‘+’ indicates present, ‘-’ indicates absent.

RESULTS AND DISCUSSION

Phytochemical screening and qualitative estimation of 21 medicinal plants studied showed that the leaves were rich in lignin followed by phenols, tannins, flavonoids and reducing sugars, maximum number of secondary metabolites were found in *Alangium salvifolium*, followed by *Tragia involucrata*, *Anthocephalus cadamba* and *Chrysanthemum indicum* (Table-1). Alkaloid compounds are found in aqueous leaf extracts of *A. echioides*, *A. salvifolium*, *L. reginae*, *M. annua* and *M. elengi*. These are produced by large variety of organisms including bacteria, fungi, plants and animals; and are part of the group of natural products; some

alkaloids have a bitter taste while many to toxic to other organisms (Gupta *et al.*, 2010). Anthraquinones are present in *G. serrata*, *C. spinarum*, *C. indicum*, *T. involucrata*, *L. reginae*, *M. annua*, *N. arbortristis*, *A. cadamba* and *M. elengi*. Anthraquinones are used better stomach-ache and in the treatment of diarrhoea (Sabris and Daniel, 1990) and these are an important chemical raw material and organic intermediates that are broadly applied in the field of dyestuff, papermaking, medicines, agricultural chemicals etc (www.shcri.com). Coumarins are rich in *A. salvifolium*, *C. indicum*, *T. involucrata* and *A. cadamba*. Various studies have been demonstrated that coumarins are potential antioxidants and their antioxidant activities are due to their ability to scavenge free radicals and to chelate metal ions (Tseng, 1991). Emodin compounds are present in *C. spinarum*, *C. indicum*, *C. melo*, *T. involucrata*, *L. reginae* and *A. cadamba*. Emodins isolated from a great deal at herbs are an effective constituent with many effects. Lots of pharmaceutical studies have demonstrated that emodins have many biological effects, such as anti-cancer, anti-microbial and anti-inflammatory effects (Wang *et al.*, 2007). Fatty acids are identified in the leaf extracts of *A. salvifolium*, *G. serrata*, *T. heyneanus* and *A. cadamba*.

Flavonoids are present in 16 plant species and absent in *C. spinarum*, *C. tuberosa*, *P. daemia*, *Z. maysorensis* and *T. involucrata*. Flavonoids are a group of polyphenolic compounds which influence the radical scavenging, inhibition of hydrolytic and oxidative enzymes and also act as anti-inflammatory agent (Frankel, 1995). The flavonoids show antioxidant activity and their effects on human nutrition and health is considerable. The mechanism of action of flavonoids are through scavenging or chelating process (Kessler *et al.*, 2003; Cook and Samman, 1996), they also inhibit microbes which are resistant to antibiotics (Linuma *et al.*, 1994). Flavonoids are free radical scavengers, super antioxidants and potent water soluble which prevent oxidative cell damage and have strong anti-cancer activity (Salah *et al.*, 1995). As antioxidants flavonoids provide anti-inflammatory actions (Okwu, 2001A; Okwu, 2001B). Glycoside substances found in *G. serrata*, *A. cathartica*, *C. spinarum*, *C. attenuata*, *C. indicum* and *N. arbortristis*. Glycoside compounds are containing a carbohydrate and non-carbohydrates residue (moiety) in the same molecule. In these compounds, the carbohydrate moiety is attached by an acetyl linkage carbon-I to the non-carbohydrate residue (aglycone). They all contain steroid as aglycone component in combination with sugar molecules. They are important in medicine because of their action on heart and are used in cardiac insufficiency (Balch and Balch, 2000). Thus, cardiac glycosides are drugs and can be used in the treatment of congestive heart failure and cardiac arrhythmia. They work by inhibiting the Na^+/Na^+ pump, resulting in an increase in the levels of sodium ions in the myocytes, which then leads to a rise in the level of calcium ions. This inhibition increases the amount of Ca^{2+} ions available for concentration of the heart muscle, improves cardiac output and reduces distention of the heart (Bertorello *et al.*, 1990; Clausen and Nielsan, 1994; Beltowski *et al.*, 1998). However, some glycosides such as ovarian are toxic as it inhibits active transport of Na^+ in cardiac muscle (Sodium pump inhibitor), resulting in inhibition of translocases during electron transport chain and leading to death (Beltowski *et al.*, 1998). Leucoanthocyanin compounds are rich in *A. salvifolium*, *A. cathartica*, *C. grandis*, *C. melo*, *A. cadamba* and *I. arborea*. These compounds are occupying an important position among the water-soluble organic compounds. They have been implicated as being responsible for the astringent taste of unripe fruits. They are responsible for the chill haze that develops in beer and for the browning of white wines. The desirable fullness of taste and body of such juices as apple, berry and grape and of fruit wines is also attributed to the astringent effect of the leucoanthocyanins. They influence the storage stability of wines and juices (Joslyn and Goldstein, 1952). Lignins are present in all leaf extract of 21 plants except only *Chrysanthemum indicum*. Lignins are significant components in the global carbon cycle; the resistance of lignin to microbial degradation enhances its persistence in soils (Campbell and Sederoff, 1996). Phenol compounds are present in 18 plants species and absent only in *C. attenuata*, *C. tuberosa* and *P. daemia*. Primarily phenolic compounds are of great importance as cellular support material because they form the integral part of cell wall structure by polymeric phenolics (Gupta *et al.*, 2010), bioactive polyphenols have attracted special attention because they can protect the human body from the oxidative stress which may cause many diseases, including cancer, cardiovascular problems and ageing (Robards *et al.*, 1999). The phenolic compounds are one of the largest and most ubiquitous group of plant metabolites. A number of studies have focused on the biological properties such as antiapoptosis, anti-

ageing, anticarcinogen, anti-inflammation, anti-atherosclerosis, cardiovascular protection and improvement of the endothelial function, as well as inhibition of angiogenesis and cell proliferation activity (Han *et al.*, 2007). Phenolic compounds have been extensively used in disinfections and remain the standards with which other bacteriocides are compared (Okwu, 2001). Deficiency of ascorbic acid is associated with pains in the joint and defect in skeletal calcification, anemia, manifestation of scurvy hemorrhage from mucous membrane of the month and gastrointestinal track (Hunt *et al.*, 1980). Reducing sugars are present in 12 plant species and absent in *A. echioides*, *C. attenuata*, *C. tuberosa*, *T. pentaphylla*, *C. grandis*, *Z. maysorensis*, *L. reginae*, *M. annua*, and *N. arbortritis*. Saponins are present in *A. salvifolium*, *T. involucrata*, *L. reginae* and *A. cadamba*. Traditionally saponins have been extensively used as detergents, as pesticides and molluscicides, in addition to their industrial applications as foaming and surface active agents and also have beneficial health effects (Shi *et al.*, 2004). Saponin has relationship with sex hormones like oxytocin. Oxytocin is a sex hormone involved in controlling the onset of labour in women and the subsequent release of milk (Okwu and Okwu, 2004). Saponins are used in veterinary vaccines as adjuvant (e.g. foot-and-mouth disease vaccines) helping to enhance immune response. They are also mild detergents and can be used commercially as well as for research (Belch and Belch, 2000). Steroids are present in *C. spinarum*, *P. daemia*, *C. indicum*, *Z. maysorensis*, *T. involucrata* and *N. arbortritis*. It should be noted that steroidal compounds are of importance and of interest in pharmacy due to their relationship with sex hormones (Santhi *et al.*, 2011). Tannins present in 17 plant species and absent in *C. attennata*, *C. tuberosa*, *P. daemia* and *A. cadamba*. Tannins has astringent properties, hastens the healing of wounds and inflamed mucous membrane. Tannins contribute property of astringency i.e. fasten the healing of wounds and inflamed mucous membrane and have received considerable attention in the fields of nutrition, health and medicine, largely due to their physiological activity, such as antioxidant, antimicrobial and anti-inflammatory properties. Tannins are complex moieties produced by majority of plants as protective substances, they have wide pharmacological activities. They have been used since past as tanning agents and they posses astringent, anti-inflammatory, antidiarrhoeal, antioxidant and antimicrobial activities (Killedar and More, 2010). Triterpenoids are present in *A. echioides*, *A. salvifolium*, *C. melo*, *T. involucrata*, *T. heyneanus* and triterpenoids which are attributed for analgesic and anti-inflammatory activities.

CONCLUSION

The medicinal plants appear to be rich in secondary metabolites, widely used in traditional medicine to combat and cure various ailments. The anti-inflammatory, antispasmodic, analgesic and diuretic can be attributed to their high lignins, phenols, tannins and flavonoids. Exploitation of these pharmacological properties involves further investigation of these active ingredients by implementation of techniques like extraction, purification, separation, crystallization and identification.

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