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Research Article

Screening of traditional medicinal plants for secondary metabolites

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ABSTRACT

Traditional medicines are prepared from a single plant or combination of more than one plant. Phytochemical constituents are responsible for medicinal activity of plant species. Hence in the present study phytochemical screening of some traditional medicinal plants was carried out. Qualitative phytochemical analysis of these plants confirm the presence of various secondary metabolites like saponins, triterpenoids, steroids, anthraquinons, 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 antioxidant, anti-inflammatory, antimicrobial and leads to the isolation of new and novel compounds.

Keywords: Traditional medicinal plants; Secondary metabolites; Phytochemical screening.

INTRODUCTION

Since ancient times plants have been using in traditional medicines for different types of ailments. 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).

Secondary metabolites of plants serve as defense mechanisms against predation by many microorganisms, insects and herbivores (Cowan, 1999). 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. Indeed, the market and public demand has been increasing so that there is a great risk that many medicinal plants today, face either extinction or loss of genetic diversity (Misra, 2009).

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Plant products have been part of phytomedicines since time immemorial. These can be derived from any part of the plant like bark, leaves, flowers, seeds, etc (Cragg and David, 2001) i.e., any part of the plant may contain active components. Knowledge of the chemical constituents of plants is desirable because such information will be of value for the synthesis of complex chemical substances. Such phytochemical screening of various plants is reported by many workers (Siddiqui *et al.,* 2009; Savithramma *et al.,* 2011; Lingarao and Savithramma, 2011; Vaghasiya *et al.,* 2011). In the present study, qualitative phytochemical analysis was carried out for about 20 medicinal plants, which are used in the preparation of various medicines.

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 Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh, India.

Sampling of plant material

Fresh leaves of 20 different plant species free from diseases were collected during the month of March, 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^{0}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 5^0C 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); anthraquinons (ASEAN, 1993), flavonoids (Peach and Tracey, 1956); and coumarins (Rizk, 1982).

RESULTS AND DISCUSSION

The phytochemical screening of 20 medicinal plants studied showed that the leaves were rich in phenols and flavonoids followed by tannins, triterpenoids, reducing sugars, anthraquinones and lignins (Table-1). Glycosides and emodins are present in 9 plants and saponins and leucoanthocyanins are found in 8 and 7 plants. Alkaloids present only in 3 plants whereas coumarins and fatty acids were identified in single plant species respectively. Maximum number of secondary metabolites were found in *Eucalyptus globulus* and *Quisqualis indica* followed by *Kalanchoe laciniata, Dodonaea viscosa* and *Clitoria ternatea. Terminalia arjuna* contain eight secondary metabolites. Among the 20 plants screened for 15 phytochemical constituents; six plants possess 7 types of secondary metabolites; four plants having six phytochemical constituents and two plants showed five secondary metabolites. Among the phytochemicals were tested the anthraquinon compounds are present in aqueous extracts of *C. halicacabum, C. papaya, C. ternatea, D. viscosa, E. globulus, K. laciniata, M. pudica, P. foetida, Q. indica* and *T. arjuna*. Anthraquinones are used better stomach-ache and in the treatment of diarrhoea (Sabnis 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). Emodins are rich in *K. laciniata* followed by *C. citrinus, D. viscosa, E. globulus, M. indica, M. pudica, Q. indica, R. minima* and *T. arjuna*. 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, antimicrobial and anti-inflammatory effects (Wang *et al.,* 2007). Flavonoid substances are rich by found in all selected plant species except *Mimosa pudica*. Flavonoids have been reported to possess many useful properties, including anti-inflammatory, oestrogenic, enzyme inhibition, antimicrobial, antiallergic, antioxidant, vascular and cytotoxic antitumour activity (Harborne and Williams, 2000). Lignins are rich in *C. ternatea* followed by *A. precatorius, C. quadrangularis, D. viscosa, E. globulus, K. laciniata, M. pudica, P. foetida, Q. indica* and *T. arjuna*. Lignins are a significant components in the global carbon cycle, the resistance of lignin to microbial degradation enhances its persistence in soils (Cambell and Sederoff, 1996). Steroid compounds are observed in *C. quadrangularis, C. guianensis* and *Q. indica*. 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).

Triterpenoid compounds are absent in the plant species of *C. halicacabum, C. papaya, C. quadrangularis, M. pudica, P. foetida, P. dulce* and *R. beddomei* among the selected group which are attributed for analgesic and anti-inflammatory activities. Tannin compounds are found in all selected species except in *A. precatorius, C. papaya, K. laciniata* and *Q. indica*. Tannins contribute property of astringency i.e. fasten the healing of wounds and inflamed mucous membrane (Okwu and Josiah, 2006). Fatty acids and coumarin compounds are absent in all leaf aqueous extracts except in *Clitoria ternatea* and *Quisqualis indica* respectively. 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 (Tsent, 1991). Phenols are shown by maximum number of species. 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). Saponin compounds are present in *A. occidentale, C. halicacabum, C. ternatea, D. viscosa, E. globulus, K. laciniata, P. dulce* and *S. emarginatus*. 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). Leucoanthocyanins are rich in leaf aqueous extracts of *C. papaya, C. ternatea, D. viscosa, K. laciniata, M. indica, M. pudica* and *R. minima*. Glycoside compounds are present in *A. precatorius, C. citrinus, C. papaya, C. guianensis, E. globulus, K. laciniata, M. pudica, P. foetida* and *P. dulce*. Reducing sugars are absent in *A. precatorius, C. ternatea, C. guianensis, D. viscosa, K. laciniata, M. indica, M. pudica* and *S. emarginatus*. Alkaloid compounds are present in only three aqueous leaf extracts of *C. papaya, C. guianensis* and *Q. indica*. 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).

Phytochemical screening of medicinal plants is very important in identifying new sources of therapeutical and industrial importance. These compounds are also

Table 1: Phytochemical screening of some important traditional medicinal plants

S.No.	Name of the plant	Name of the secondary metabolite														
		Re	Em	Fl	Li	St	Ti	An	Co	Fa	Ph	Ta	Sa	Le	Gl	Al
1.	*Abrus precatorius* L. (Fabaceae)	-	-	+	+	-	+	-	-	-	+	-	-	-	+	-
2.	*Anacardium occidentale* L. (Anacardiaceae)	+	-	+	-	-	+	-	-	-	+	+	+	-	-	-
3.	*Callistemon citrinus* (Curt.) Skeel (Myrtaceae)	++	+	++	-	-	+	-	-	-	++	++	-	-	++	-
4.	*Cardiospermum halicacabum* L. (Sapindaceae)	+	-	+	-	-	-	+	-	-	+	+	+	-	-	-
5.	*Carica papaya* L. (Caricaceae)	+	-	++	-	-	-	+	-	-	++	-	-	++	+	+
6.	*Cissus quadrangularis* L. (Vitaceae)	+	-	+	+	+	-	-	-	-	+	+	-	-	-	-
7.	*Clitoria ternatea* L. (Fabaceae)	-	-	++	++	-	+	+	-	+	+	+	+	++	-	-
8.	*Couroupita guianensis* Aublet (Lecythidaceae)	-	-	+	-	+	+	-	-	-	+	+	-	-	+	+
9.	*Dodonaea viscosa* L. Jacq (Sapindaceae)	-	+	++	+	-	+	+	-	-	++	+	+	++	-	-
10.	*Eucalyptus globulus* Labill. (Myrtaceae)	+	+	++	+	-	++	+	-	-	++	++	+	-	+	-
11.	*Kalanchoe laciniata* (L) Pers. (Crassulaceae)	-	++	+	+	-	+	+	-	-	++	-	+	+	++	-
12.	*Mangifera indica* L. (Anacardiaceae)	-	+	++	-	-	+	-	-	-	++	+	-	+	-	-
13.	*Mimosa pudica* L. (Mimosaceae)	-	+	-	+	-	-	+	-	-	+	+	-	+	+	-
14.	*Passiflora foetida* L. (Passifloraceae)	+	-	+	+	-	-	+	-	-	-	+	-	-	+	-
15.	*Pithecellobium dulce* (Roxb.) Benth. (Mimosaceae)	+	-	+	-	-	-	-	-	-	+	+	+	-	+	-
16.	*Quisqualis indica* L. (Combritaceae)	+	+	++	+	+	+	+	+	-	+	-	-	-	-	+
17.	*Rhynchosia beddomei* Baker (Fabaceae)	+	-	++	-	-	-	-	-	-	+	+	-	-	-	-
18.	*Rhynchosia minima* (L) DC. (Fabaceae)	+	+	++	-	-	++	-	-	-	++	+	-	+	-	-
19.	*Sapindus emarginatus* Vahl. (Sapindaceae)	-	-	+	-	-	+	-	-	-	+	+	+	-	-	-
20.	*Terminalia arjuna* (DC.) weight & Arn. (Combretaceae)	+	+	+	+	-	+	+	-	-	+	+	-	-	-	-

Note: Re – Reducing sugars, Em – Emodins, Fl – Flavonoids, Li – Lignins, St – Steroids, Ti – Triterpenoids, An – Anthraquinons, Co – Coumarins, Fa – Fatty acids, Ph – Phenols, Ta – Tannins, Sa – Saponins, Le – Leucoanthocyanins, Gl- Glycosides, Al – Alkaloids, '++' more amount '+' indicates presence; '-' indicates absence

useful tool for the comparative studies of the amount of bioactive principles present in different parts of the plant and other plant species and among populations belonging to different regions with different climatic conditions (Uddin *et al.,* 2011). The present communication is an attempt to assess the status of phytochemical properties in leaves of traditional medicinal plants to improve the health status of people and also to use in the preparation of pharmaceutical and nutraceutical products of commercial importance.

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 phenols, flavonoids, tannins, triterpenoids and reducing sugars. 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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