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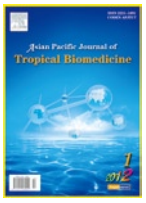

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Preliminary phytochemical studies on the methanolic flower extracts of some selected medicinal plants from India

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ABSTRACT

Objective: To explore the phytochemical constituents of the methanolic flower extracts of *Helictres isora* (*H. isora*), *Spathodea campanulata* (*S. campanulata*), *Antigonon leptopus* (*A. leptopus*) and *Thunbergia grandiflora* (*T. grandiflora*). **Methods:** The preliminary phytochemical screening was performed by Harborne method. **Results:** The results of the phytochemical screening revealed that alkaloids, phenol, tannins, xanthoproteins, carboxylic acid, coumarins and carbohydrates presence in the methanolic extracts of *H. isora*. The methanolic extracts of *S. campanulata* displayed the presence of alkaloids, phenol, coumarins and carbohydrates. The phenol, saponins, aminoacids, steroids, phytosterols, triterpenoids, sapogenis, tannins, xanthoprotein, carboxylic acid and coumarins were present in the methanolic extracts of *A. leptopus*. The methanolic extracts of *T. grandiflora* showed only the alkaloids and phenols presence and other constituents were failed to demonstrate in the methanolic extracts of *T. grandiflora*. **Conclusions:** The antimicrobial activity of *H. isora*, *S. campanulata*, *A. leptopus* and *T. grandiflora* may be due to one/more group of above phyto-constituents. From the results, it can be concluded that the methanolic flower extracts of *H. isora*, *S. campanulata*, *A. leptopus* and *T. grandiflora* may be used as broad-spectrum antimicrobial, bioactive agent after extensive investigation.

1. Introduction

Natural products are a source of synthetic and traditional herbal medicine. They are the primary health care system in some parts of the world[1]. The past decade has seen considerable change in opinion regarding ethnopharmacological therapeutic applications. The extracts from the fruits, leaves and bark of *Helictres isora* (*H. isora*) L. (Sterculiaceae) have been used by Ayurvedic physicians in India for external use to treat skin problems, dermatitis, eczema, acne, gastropasm. It is used as an anthlmintic for tapeworm in Indonesia, as an antispasmodic, antipyretic, anti-diarrohoeal and anti-dysentric in Saudi Arabia and as a tonic compound after childbirth in Malayan Islands. In traditional use, the root juice is claimed to be useful in treating cough, asthma, diabetes, empyenma, intestinal infections, a cure for scabies when applied topically and a favorite cure for snakebites[2,3]. Fruits are demulcent, mildly astringent and useful in griping and flatulence. A potent inhibitory activity of aqueous hot extract of *H. isora* fruits was reported against reverse transcriptase from avian myeloblastosis virus and anti-human immunodeficiency virus type-1[4]. The bark of *H. isora* has been used in the indigenous systems of medicine in India for the treatment of diabetes mellitus since time immemorial. From the roots, cucurbitacin B and iso-cucurbitacin B were isolated and reported to possess cytotoxic activity, antiperoxidative effect, and hypolipidaemic effect. The aqueous extract of the bark showed significant hypoglycaemic effect. It can reinstate brain antioxidant enzymes, heart antioxidant enzymes, and hepatic enzymes. Aqueous extract of *H. isora* improves the level of plasma insulin, decrease glucose levels, reverses the changes in the levels of the carbohydrate moieties of glycoproteins and protein marker enzymes, and posess glycaemic control and renoprotective activity in streptozotocin-induced diabetic Rats[5-14]. *Spathodea campanulata* (*S. campanulata*) P. Beauv (*Bignoniaceae*) is one of such medicinal plants commonly employed to control epilepsy. This species has many uses in folk medicine. The flowers are employed as diuretic and anti-inflammatory,

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while the leaves are against kidney diseases, urethra inflammations and as an antidote against animal poisons. Several phytochemical studies were performed with different parts of *S. campanulata*, including stem barks, leaves, flowers and fruits. The leaves have furnished spathodol, caffeic acid and other phenolic acids and flavonoids, while fruits contain polyphenols, tannins, saponins and glycosides. The plant leaf is used in the treatment of painful inflammation, constipation, dysentery, and is reported to have anti-plasmodial activity, analgesic and anti-inflammatory actions, anti-larvicidal activity and repellent activity, anti-convulsant effect and antimicrobial activity[15-23]. In Thailand, flour coated leaves and flowers of *Antigonon leptopus* (*A. leptopus*) Hook. Et. Arn. are served with noodles. The flowers are also used in omelets[24]. Traditionally the leaves of *A. leptopus* have been used to reduce swelling, and a tea from the leaves can be made to treat diabetes and the blossoms is used to treat high blood pressure. A hot tea prepared from the aerial portion of this plant is used as a treatment for cough and throat constriction in Jamaica and considered as one of the important medicinal plants in their folk medicine. The vine is used to treat cough and throat constriction. It possesses anti-cogualnt activity, analgesic, anti-thrombin, anti-inflammatory activity, anti-diabetic and lipid peroxidation inhibitory activities, anti-thelmentic activity and anti-convulsant activity[25-27]. But there is no report about the phytochemical constituents study on the methanolic flower extracts of *H. isora*, *S. campanulata*, *A. leptopus* and *Thunbergia grandiflora* (*T. grandiflora*) from India. With this background the present study was aimed to explore the phytochemical constituents of the methanolic flower extracts of *H. isora*, *S. campanulata*, *A. leptopus* and *T. grandiflora*.

2. Materials and methods

The flowers of *H. isora L. (Sterculiaceae)*, *S. campanulata P. Beavu (Bignoniaceae)*, *A. leptopus L.(Polygonaceae)* and *T. grandiflora* Roxb. (Acanthaceae) were collected from Kanyakumari Wildlife Sanctuary, Tamil Nadu, India and authenticated by Dr. S. Jeeva, following identification a voucher specimen of the plant was deposited in the herbarium of Department of Botany, Nesamony Memorial Christian College, Marthandam-629165, Tamil Nadu, India. The flowers were examined carefully and old, infected, and fungus damaged flowers were removed. Extracts were prepared from fresh flowers. 50 g of fresh flowers petals of *H. isora*, *S. campanulata*, *A. leptopus* and *T. grandiflora were collected* and kept in closed conical flask with 200 mL of methanol in a shaker at room temperature for 24 h. After incubation, the extracts were filtered through Whatman No. 41 filter paper and the extracts were collected and stored in the refrigerator at 4℃. The methanolic flower extracts were concentrated using vacuum evaporator and dried at 60℃. The preliminary phytochemical screening was performed by Harborne method[28].

3. Results

The crude methanolic flower extracts of *H. isora*, *S. campanulata*, *A. leptopus* and *T. grandiflora* contained a greater proportion by mass of the component compounds as shown in Table 1. The results of the phytochemical screening revealed that alkaloids, phenol, tannins, xanthoproteins, carboxylic acid, coumarins and carbohydrates presence in the methanolic extracts of *H. isora*. The methanolic extracts of *S. campanulata* displayed the presence of alkaloids, phenol, coumarins and carbohydrates. The phenol, saponins, aminoacids, steroids, phytosterols, triterpenoids, sapogenis, tannins, xanthoprotein, carboxylic acid and coumarins were present in the methanolic extracts of *A. leptopus*. The methanolic extracts of *T. grandiflora* showed only the alkaloids and phenols presence and other constituents were failed to demonstrate in the methanolic extracts of *T. grandiflora*.

Table 1.
Phytochemical screening of the methanolic extracts of *H. isora* L., *S. campanulata P. Beavu*, *A. leptopus* L and *T. grandiflora* Roxb flowers.

Phytochemical constituents	Botanical name			
	H. isora	*S. campanulata*	*A. leptopus*	*T. grandiflora*
Alkaloids	+	+	−	+
Phenol	+	+	+	+
Flavanoids	−	−	−	−
Saponins	−	−	+	−
Aminoacids	−	−	+	−
Quinones	−	−	−	−
Steroids, phytosterols, triterpenoidal sapogenis	−	−	+	−
Tannins	+	−	+	−
Xanthoproteins	+	−	+	−
Carboxylic acid	+	−	+	−
Coumarins	+	+	+	−
Carbohydrates	+	+	−	−

4. Discussion

The plants known as medicinal, are rich in secondary metabolites which include alkaloids, glycosides, flavonoids, insecticides, steroids, related active metabolites. They are of great medicinal value and have been extensively used in the drug and pharmaceutical industry. Recently, a number of studies have been reported on the phytochemistry of plants across the world. In the present investigation, four plants flowers have been selected from India for phytochemical screening on the basis of traditional uses. The present phytochemcial study revealed the presence of phenols in all selected plants flower extracts, coumarin in *H. isora, S. campanulata* and *A. leptopus*, alkaloids in *H. isora, S. campanulata* and *T. grandiflora*, tannins, xanthoproteins and carboxylic acid in *H. isora* and *A. leptopus*, saponins, steroids, triterpenoids and aminoacids only in *A. leptopus*. Many tannin-containing drugs are used in medicine as astringent. They are used in the treatment of burns as they precipitate the proteins of exposed tissues to form a protective covering. They are also medicinally used as healing agents in inflammation, leucorrhoea, gonorrhoea, burns, piles and as antidote. Tannins has been found to have antiviral, antibacterial, antiparasitic effects, anti-inflammatory, antiulcer and antioxidant property for possible therapeutic applications[29-31]. In the present study we revealed the tannins, xanthoproteins and carboxylic acid presence in *H. isora* and *A. leptopus*. In addition to the previous observation the present study revealed and supplemented the phyto-constituents from the flower extracts of *H. isora* and *A. leptopus*.

Saponins are considered as a key ingredient in traditional Chinese medicine and are responsible for most of the observed biological effects. Saponins are known to produce inhibitory effect on inflammation. There is tremendous, commercially driven promotion of saponins as dietary supplements and nutriceuticals. Saponin possesses specific physical, chemical and biological activities that make them useful as drugs. Some of these biological properties include antimicrobial, anti-inflammatory, anti-feedent, and hemolytic effects[32,33]. These observations cited on phytochemical compounds support our findings on the usefulness of *A. leptopus* in traditional medicament. Coumarin has been used as anti-coagulant drugs and to treat lymphedema[34]. In the present study we observed the coumarin presence in the methanolic flower extracts of *H. isora, S. campanulata* and *A. leptopus*. The results of the present study supplement the folkloric usage and the previous observations of *A. leptopus* and suggest that some of the flower extracts possess compounds with anticoagulant properties that can be used as anticoagulant agents in the near future.

Medical use of alkaloid plants has a long history, and thus when the first alkaloids were synthesized in the 19th century, they immediately found application in clinical practice. In addition, alkaloids possess anti-inflammatory, anti-asthmatic, and anti-anaphylactic properties with consequences of altered immunological status *in vivo*. Furthermore, alkaloid which is one of the largest phytochemical groups in plants has amazing effect on humans and this has led to the development of powerful pain killer medications[35,36]. In the present study we also confirmed the presence of alkaloids in the methanolic flower extracts of *H. isora, S. campanulata* and *T. grandiflora* and that augments the use of alkaloid in global pharmaceutical market. Flavonoids, the major group of phenolic compounds are reported for their antimicrobial, antiviral and spasmolytic activity. Flavonoids are able to scavenge hydroxyl radicals, superoxide anion radicals and lipid peroxy radicals, which highlights many of the flavonoid health-promoting functions in organism. They are important for prevention of diseases associated with oxidative damage of membrane, proteins and DNA. Flavonoids in human diet may reduce the risk of various cancers, as well as preventing menopausal symptoms. Flavonoids, on the other hand, are potent water-soluble antioxidants and free radical scavengers, which prevent oxidative cell damage and have strong anti-cancer activity[37-39]. Phytochemical studies on the methanolic flower extracts of *H. isora, S. campanulata, A. leptopus* and *T. grandiflora* revealed the presence of carbohydrates, steroids, alkaloids, glycosides, tannins, saponins, flavones, and phenolic compounds. The antimicrobial activity of *H. isora, S. campanulata A. leptopus* and *T. grandiflora* may be due to one/more group of above phyto-constituents. From the results, it can be concluded that the methanolic flower extracts of *H. isora, S. campanulata, A. leptopus* and *T. grandiflora* find use as broad-spectrum antimicrobial, bioactive agent after extensive investigation. Further work will emphasize the isolation and characterization of active principles responsible for bio-efficacy and bioactivity.

Conflict of interest statement

We declare that we have no conflict of interest.

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