

Original Article

PRELIMINARY PHYTOCHEMICAL SCREENING OF SIX MEDICINAL PLANTS USED IN
TRADITIONAL MEDICINE

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ABSTRACT

Objective: Preliminary screening of phytochemicals is a valuable step, in the detection of the bioactive principles present in medicinal plants and subsequently may lead to drug discovery and development. In the present study, chief phytoconstituents of the six selected medicinal plants of different families were identified in order to relate their presence with bioactivities of the plants.

Methods: Screening of six selected medicinal plants was performed for the presence of tannins, flavonoids, terpenoids, saponins, steroids, phlobatannins, carbohydrates, glycosides, coumarins, alkaloids, proteins, emodins, anthraquinones, anthocyanins and leucoanthocyanins using standard methods.

Results: All the selected medicinal plants were found to contain tannins and flavonoids. Moreover, terpenoids were also present in all the selected plants except *P. dactylifera*. On the other hand, saponins and steroids were absent in all plants except *S. chirata* and phlobatannins were absent in all plants except *R. sativus*. In addition, carbohydrates, glycosides and coumarins were present in all the selected plants except *P. dactylifera* and *R. sativus*. Alkaloids were present in all the selected plants except *F. religiosa*, *P. dactylifera* and *R. sativus*. Proteins were present only in *F. religiosa* and *S. chirata*. Whereas emodins, anthraquinones, anthocyanins and leucoanthocyanins were absent in all the selected six plants.

Conclusion: It is evident from the study that *S. chirata* is of highest therapeutic efficacy possessing majority of phytochemical classes of compounds and *P. dactylifera* is of lowest therapeutic potential due to the absence of majority of phytoconstituents.

Keywords: Medicinal plants, Preliminary, Screening, Phytochemical.

INTRODUCTION

Medicinal plants besides therapeutic agents are also a big source of information for a wide variety of chemical constituents which could be developed as drugs with precise selectivity. These are the reservoirs of potentially useful chemical compounds which could serve as newer leads and clues for modern drug design [1]. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds [2]. Correlation between the phytoconstituents and the bioactivity of plant is desirable to know for the synthesis of compounds with specific activities to treat various health ailments and chronic diseases as well [3].

Owing to the significance in the above context, such preliminary phytochemical screening of plants is the need of the hour in order to discover and develop novel therapeutic agents with improved efficacy. Numerous research groups have also reported such studies throughout the world [4-8]. Thus, the present study deals with the screening based on phytochemical tests of six medicinal plants viz., *Ficus religiosa*, *Citrus limonia*, *Phoenix dactylifera*, *S. indicum*, *Swertia chirata* and *Raphanus sativus* for identifying their chemical constituents. All these plants possess different bioactivities which were later correlated with the presence of some specific phytoconstituents.

MATERIALS AND METHODS

Plant materials

Fresh leaves of *F. religiosa* (Family: Moraceae) & *C. limonia* (Family: Rutaceae), seeds of *P. dactylifera* (Family: Arecaceae), stems of *S. chirata* (Family: Gentianaceae), black seeds of *Sesamum indicum* (Family: Pedaliaceae) and roots of *R. sativus* (Family: Brassicaceae) were collected locally from Allahabad, U. P., India and got identified by Prof. Satyanarayan, Taxonomist, Department of Botany, University of Allahabad, Allahabad, U. P., India. Voucher specimens have been submitted to the University herbarium.

Preparation of extracts

The collected leaves (*F. religiosa* & *C. limonia*), seeds (*P. dactylifera*) and stems (*S. chirata*) were washed well, shade dried and powdered. Black seeds of *S. indicum* were extracted in mechanical oil expeller machine which yielded oil and blackish solid residue. This blackish powder so obtained is called as Khali and used for extraction. They were then extracted with hot distilled water using soxhlet apparatus till the colorless solvent was obtained. Roots of *R. sativus* were crushed in an electric blender to obtain root juice. Extracts obtained were filtered, concentrated and allowed to dry till constant weight was obtained.

Phytochemical tests

Screening of the above six selected medicinal plants for various phytochemical constituents were carried out using standard methods [9-11] as described in Table 1:

RESULTS

The data shown in Table 2 shows screening of aqueous extracts of different parts of six medicinal plants viz., *F. religiosa*, *C. limonia*, *P. dactylifera*, *S. indicum*, *S. chirata* and *R. sativus* based on phytochemical tests. These tests reveal the presence of various bioactive secondary metabolites which might be responsible for their medicinal attributes. The observations and inferences made in the phytochemical tests are presented as follows:

Tannins: A green precipitate was observed in all the extracts indicating thereby the presence of tannins in all six medicinal plants analysed.

Flavonoids: A yellow coloration was also observed in all the extracts indicating thereby the presence of flavonoids in all six medicinal plants screened.

Terpenoids: A deep red color was observed in five extracts out of six except *P. dactylifera*.

Saponins: Persistent frothing on warming the extract of *S. chirata* indicated the presence of saponins in this plant only. The same extract with few drops of olive oil formed a soluble emulsion, confirming the presence of saponins.

Steroids: A reddish brown ring at the interface was observed only with the extract of *S. chirata* out of six screened plants indicating the presence of steroids only in this plant.

Phlobatannins: Presence of a red precipitate in *R. sativus* root juice only was taken as an evidence for the presence of phlobatannins in this.

Carbohydrates: Red violet ring appeared at the junction in most of the extracts was confirmed by the presence of carbohydrates except *P. dactylifera* and *R. sativus*.

Glycosides: Similarly, a color change from violet to blue to green confirming the presence of glycosides was also observed in all other extracts except *P. dactylifera* and *R. sativus*.

Coumarins: Interestingly, formation of yellow color as an indication of coumarin presence was also found only in those four extracts which showed the presence carbohydrates and glycosides. The results were again negative for *P. dactylifera* and

R. sativus indicating thereby the absence of coumarins in their extracts.

Alkaloids: A yellow precipitate was observed in three extracts confirming thereby the presence of alkaloids. Surprisingly, this time *F. religiosa* were also devoid of alkaloids in addition to *P. dactylifera* and *R. sativus*.

Proteins: White precipitate formation which turns yellow on boiling was only observed in the extract of *S. chirata* and *F. religiosa* showing thereby the presence of proteins and confirming thereby the absence of proteins in rest of the extracts.

Emodins: Absence of red color indicated the absence of emodins in all the six extracts.

Anthraquinones: Absence of a pink, violet or red coloration in ammonical layer indicated the absence of free anthraquinones in all the six extracts.

Anthocyanins: The absence of pink-red to blue-violet coloration indicated the absence of anthocyanins in all the six extracts.

Leucoanthocyanins: Absence of red color in organic layer indicated the absence of leucoanthocyanins in all the six extracts.

Table 1: Preliminary phytochemical tests for plant extracts

Phytoconstituents	Test	Observation
Tannins (Braymer's Test)	2ml extract + 2ml H ₂ O + 2-3 drops FeCl ₃ (5%)	Green precipitate
Flavonoids	1ml extract + 1ml Pb(OAc) ₄ (10%)	Yellow coloration
Terpenoids	2ml extract + 2ml (CH ₃ CO) ₂ O + 2-3 drops conc. H ₂ SO ₄	Deep red coloration
Saponins (Foam Test)	(a) 5ml extract + 5ml H ₂ O + heat (b) 5ml extract + Olive oil (few drops)	Froth appears Emulsion forms
Steroids (Salkowski Test)	2ml extract + 2ml CHCl ₃ + 2ml H ₂ SO ₄ (conc.)	Reddish brown ring at the junction
Phlobatannins (Precipitate Test)	2ml extract + 2ml HCl (1%) + heat	Red precipitate
Carbohydrates (Molisch's Test)	2ml extract + 10ml H ₂ O + 2 drops Ethanolic α-naphthol (20%) + 2ml H ₂ SO ₄ (conc.)	Reddish violet ring at the junction
Glycosides (Liebermann's Test)	2ml extract + 2ml CHCl ₃ + 2ml CH ₃ COOH	Violet to Blue to Green coloration
Coumarins	2ml extract + 3ml NaOH (10%)	Yellow coloration
Alkaloids (Hager's Test)	2ml extract + few drops of Hager's reagent	Yellow precipitate
Proteins (Xanthoproteic Test)	1ml extract + 1ml H ₂ SO ₄ (conc.)	White precipitate
Emodins	2ml extract + 2ml NH ₄ OH + 3ml Benzene	Red coloration
Anthraquinones (Borntrager's Test)	3ml extract + 3ml Benzene + 5ml NH ₃ (10%)	Pink, Violet or Red coloration in ammonical layer
Anthocyanins	2ml extract + 2ml HCl (2N) + NH ₃	Pinkish red to bluish violet coloration
Leucoanthocyanins turns	5ml extract + 5ml Isoamyl alcohol	Organic layer into Red

Table 2: Results of phytochemical analyses of the selected six medicinal plants

Variable	<i>F. religiosa</i> (Leaves)	<i>C. limonia</i> (Leaves)	<i>P. dactylifera</i> (Seeds)	<i>S. indicum</i> (Khali)	<i>S. chirata</i> (Stems)	<i>R. sativus</i> (Root juice)
Tannins	+	+	+	+	+	+
Flavonoids	+	+	+	+	+	+
Terpenoids	+	+	-	+	+	+
Saponins	-	-	-	-	+	-
Steroids	-	-	-	-	+	-
Phlobatannins	-	-	-	-	-	+
Carbohydrates	+	+	-	+	+	-
Glycosides	+	+	-	+	+	-
Coumarins	+	+	-	+	+	-
Alkaloids	-	+	-	+	+	-
Proteins	+	-	-	-	+	-
Emodins	-	-	-	-	+	-
Anthraquinones	-	-	-	-	-	-
Anthocyanins	-	-	-	-	-	-
Leuco-anthocyanins	-	-	-	-	-	-

(+) = Presence, (-) = Absence

DISCUSSION

These secondary metabolites contribute significantly towards the biological activities of medicinal plants such as hypoglycemic, antidiabetic, antioxidant, antimicrobial, antiinflammatory, anticarcinogenic, antimalarial, anticholinergic, antileprosy activities etc. [12].

All the six selected medicinal plants for screening were found to possess tannins. Tannins have amazing stringent properties. They are known to hasten the healing of wounds and inflamed mucous membranes. Flavonoids are also present in all six selected medicinal plants as a potent water-soluble antioxidant and free radical scavenger, which prevent oxidative cell damage and also have strong anticancer activity [13-14]. It also helps in managing diabetes induced oxidative stress. Terpenoids have been found to be useful in the prevention and therapy of several diseases, including cancer. Terpenoids are also known to possess antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, antiinflammatory and immunomodulatory properties [15-16]. In addition, terpenoids can be used as protective substances in storing agriculture products as they are known to have insecticidal properties as well [17].

But, surprisingly it was present in all other screened plants except *P. dactylifera*, indicating thereby its low medicinal value in comparison to other screened plants. Numerous studies have confirmed that saponins possess the unique property of precipitating and coagulating red blood cells [18-19] and steroids are responsible for cholesterol-reducing properties. Steroids also help in regulating the immune response [20]. Interestingly, both saponins and steroids are present only in *S. chirata* which is supposed to be of maximum medicinal value out of the six investigated plants as it possesses majority of identified phytoconstituents. In traditional system of medicine, *S. chirata* has been regularly used as a blood purifier and also as a blood glucose lowering agent.

Phlobatannins have been reported to possess astringent properties [21] and it was found only in *R. sativus* out of all the screened plants. Though, majority of analysed natural products were found to be absent in *R. sativus* except the most common ones viz., tannins, flavonoids and terpenoids. Out of fifteen phytoconstituents for which these six medicinal plants were screened carbohydrates, glycosides and coumarins were found to be absent in *P. dactylifera* as well as *R. sativus* suggesting thereby the absence of therapeutic efficacies associated with these phytoconstituents in these two plants. Plants containing carbohydrates, glycosides and coumarins are known to exert a beneficial action on immune system by increasing body strength and hence are valuable as dietary supplements. Coumarins can be suggested to be beneficial for hyperproliferative skin diseases on the basis of their antimicrobial and antiinflammatory effects [22]. Glycosides also have vast therapeutic efficacy as they are found in almost every medicinal plant.

Moreover, alkaloids represent a class which affects the central nervous system, reduces appetite and behaves as diuretic [23]. It was found only in *C. limonia*, *S. indicum* and *S. chirata*. Proteins are the building blocks of life. The body needs protein to repair and maintain itself. Since it was present only in *S. chirata* and *F. religiosa* therefore nutritional power of these plants as protein supplements cannot be ignored [24]. Thus, from the present investigation medicinal properties of the selected six plants can be identified based on the phytoconstituents present in them.

CONCLUSION

Screening of six selected medicinal plants clearly reveals that the maximum classes of phytoconstituents are present in *S. chirata* extract as compared to other five selected plant extracts. Hence, the above plant extract could be explored for its highest therapeutic efficacy by pharmaceutical companies in order to develop safe drugs for various ailments. The other five studied plants are of equal importance due to the presence of most of the tested major phytoconstituents. Since these plants have been used in the treatment of different ailments, the medicinal roles of these plants could be related to such identified bioactive compounds. The

quantitative analyses of these phytochemicals will be an interesting area for further study. Efforts should be geared up to exploit the biomedical applications of these screened plants due to the presence of certain class of phytochemicals for their full utilization.

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