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PHYTOCHEMICAL ANALYSIS OF CERTAIN TRADITIONAL MEDICINAL PLANTS

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ABSTRACT

The traditional medicine involves the use of different plant extracts or the bioactive constituents. For this study, nine medicinal plants such as *Andrographis paniculata, Bixa orellana, Catharanthus roseus, Curcuma longa, Ocimum sanctum, Phyllanthus niruri, Terminalis bellerica, Terminalua chebula* and *Tinospora cordifolia*, were subjected to phytochemical analysis employing standard methods. The study confirms the presence of various phytochemicals like Alkaloids, Flavonoids, Saponins, Glycosides, Phenols, Proteins, Steroids, Terpenoids and Tannins. The results obtained in the present study suggest that these plants could be used for curing various ailments and possess potential antioxidant properties and can be used for the isolation of new and novel bioactive compounds.

KEYWORDS: **Medicinal plants, Plant extract, Phytochemicals.**

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INTRODUCTION

Since ancient times people have been exploring nature particularly plants, in search of new drugs. This has resulted in the use of large number of medicinal plants with curative properties to treat various diseases[1.] According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of drugs. About 80% of individuals from developed countries used traditional medicines, which have compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety and efficiency[2]. The active compounds currently isolated from the higher plants are widely used in modern medicine and today 80% show a positive correlation between their modern therapeutic use and the traditional use of the plants from which they are derived[3]. Traditional medicinal plants are often cheaper, locally available and easily consumable, raw or as simple medicinal preparations[4]. Nowadays, traditional medicinal practices form an integral part of complementary or alternative medicine. Although their efficacy and mechanism of action have not been tested scientifically in most cases, these simple medicinal preparations often mediate beneficial responses due to their chemical constituents. Hence during the present investigation phytochemical screening of certain native plants of Tiruchengodu is carried out with a view to analyse the presence of chemical constituents that included primary and secondary metabolites, to ascertain ethnomedicinal claims of their widely used medicinal plants.

MATERIALS AND METHODS

Collection of plant materials

Fresh parts of nine medicinal plants, *Andrographis paniculata* Nees., *Bixa orellana* L., *Cathranthus roseus* L., *Curcuma longa* L., *Ocimum sanctum* L., *Phyllanthus niruri* L., *Terminalia bellerica* (Gaertn.) Roxb., *Terminalia chebula* Retz. and *Tinospora cordifolia* (Thunb) Miers. were collected from different regions in Namakkal Districts of Tamil Nadu. The plant materials were taxonomically identified and authenticated by The Department of Botany, Auxilium College (Autonomous), Thiruvalluvar University, Vellore, Tamil Nadu. The plant materials were dried until all the water molecules evaporated and plants became well dried for grinding. After drying, the plant materials were ground well using mechanical blender into fine powder labeling for future use.

Preparation of plant extracts

Crude plant extracts were prepared by Soxhlet extraction method. About 20 gm of powdered plant material was uniformly packed into a thimble and extracted with 250 ml of different solvents separately. Solvents used were methanol, ethanol and acetone. The process of extraction continued for 24 hours or till the solvent in siphon tube of an extractor became colorless. After that the extracts were taken in beakers and kept on a hot plate and heated at 30 - 40ºC till all the solvent got evaporated. Dried extracts were kept in a refrigerator at 4ºC for their future use in phytochemical analysis.

Qualitative phytochemical analysis

The extracts were tested for the presence of bioactive compounds by using following standard methods[5],[6],[7].

Test for Alkaloids

Crude extract was mixed with 2ml of 1% HCl and heated gently. Mayer's reagent was then added to the mixture. Turbidity of the resulting precipitate was taken as an evidence for the presence of alkaloids.

Test for Flavonoids

Crude extract was mixed with 2ml of 2% solution of NaOH. An intense yellow colour was formed which turned colourless on addition of few drops of dilute acid which indicated the presence of flavonoids.

Test for Glycosides
2ml of concentrated H_2SO_4 was added carefully and shaken gently. A reddish brown colour indicated the presence of steroidal ring. i e., glycone portion of the glycoside.

Test for Phenols
Crude extract was mixed with 2ml of 2% solution of $FeCl_3$. A blue green or black coloration indicated the presence of phenols.

Test for proteins
When crude extract was boiled with 2ml of 0.2% solution of Ninhydrin, violet colour appeared suggesting the presence of proteins.

Test for saponins
Crude extract was mixed with 5ml distilled water in a test tube and it was shaken vigorously. The formation of stable foam was taken as an indication for the presence of saponins.

Test for steroids
Crude extract was mixed with 2ml of chloroform and concentrated H_2SO_4 was added
sidewise. A red colour produced in the lower chloroform layer indicated the presence of steroids.

Test for tannins
Crude extract was mixed with 2ml of 2% solution of $FeCl_3$. A blue – green or black colouration indicated the presence of tannins.

Test for terpenoids
Crude extract was dissolved in 2ml of chloroform and evaporated to dryness. To this 2ml of concentrated H_2SO_4 was added and heated for about 2 minutes.

RESULTS

The results of preliminary phytochemical analysis are tabulated in Table 1. The phytochemical study revealed the presence of various phytocompounds in the solvent extracts. In the methanolic solvent extract of *Andrographis paniculata* various phytocompounds like flavonoids, proteins, steroids and terpenoids were present and alkaloids, glycosides, phenols, saponins and tannins were absent. However in ethanolic solvent extract, glycosides, phenols, proteins, saponins and terpenoids were absent and other compounds were found to be present. In acetone extract only phenols, proteins, saponins, steroids and tannins were found to be present, while the rest of the compounds were found to be absent. In the methanolic solvent extract of *Bixa orellana* alkaloids, glycosides and phenols were present where as flavonoids, phenols, proteins, saponins, steroids, tannins and terpenoids were tested absent. Ethanol extract showed the presence of only alkaloids, flavonoids, glycosides, phenols, and others were absent. The acetone extract showed only the presence of alkaloids and phenols, rest of the compounds were found to be absent. Methanolic extract of *Cathatanthus roseus* showed the presence of flavonoids, saponins and steroids, except alkaloids, glycosides, phenols, proteins, tannins and terpenoids. However in the ethanolic extract, alkaloids, flavonoids, phenols, saponins, steroids and tannins were present rest of the compounds were absent. In acetone extract, phenols and saponins were present and rest of the compounds were absent. In the methanolic solvent extract various phytocompounds like alkaloids, steroids and terpenoids were present in *Curcuma longa.* However in ethanolic solvent extract, flavonoids, glycosides, phenols, proteins and tannins were absent and other compounds were found to be present, whereas in acetone extract only flavonoids and proteins were found. While the rest of the compounds were absent. In the methanolic solvent extract of *Ocinum sanctum* alkaloids, glycosides, phenols, proteins, saponins, and tannins were present, and rest of the compounds were absent. Ethanol extract showed the presence alkaloids, glycosides, phenols, proteins, saponins, steroids and tannins were present. While the rest of the compounds were absent. In acetone extract showed the absence of only flavonoids and terpenoids, rest of the

compounds were present. In methanol and ethanol solvent extracts showed the presence of all the phytocompounds were present. Where as in acetone extract only glycosides, proteins and terpenoids were found to be present, while the rest of the compounds were absent in *Phyllanthus niruri*. In the methanol, ethanol and acetone solvent extracts of various phytocompounds like flavonoids, glycosides, proteins, saponins, steroids tannins and terpenoids were present in *Terminalia bellerica* except alkaloids. In the methanolic solvent extract of *Terminalia chebula* alkaloids, flavonoids, phenols, proteins, saponins, steroids and tannins were present and rest of the compounds were found to be absent. Ethanol extract showed the presence alkaloids, flavonoids, phenols, saponins, steroids and tannins were present *Terminalia chebula* except glycosides, proteins and terpenoids. In acetone extract showed the absence glycosides, proteins, saponins, steroids and terpenoids, rest of the compounds were found to be present. In the methanolic solvent extract of *Tinospora cordifolia* alkaloids, flavonoids, phenols, proteins steroids and terpenoids were present and except in glycosides, saponins and tannins. Ethanol extract showed the presence alkaloids, flavonoids, phenols, proteins and steroids were present and other compounds were found to be absent. In acetone extract showed the absence of glycosides, saponins and terpenoids, rest of the compounds were present.

DISCUSSION

All plants produce chemical compounds as part of their normal metabolic activities. Plant synthesizes a wide variety of chemical compounds, which can be sorted by their chemical class, biosynthetic origin and functional groups into primary and secondary metabolites[8]. Successive isolation of botanical compounds from plant material is largely dependent on the type of solvent used in the extraction procedure. Phytochemical analysis conducted on the plant extracts revealed the presence of constituents which are known to exhibit medicinal as well as physiological activities[5]. The alkaloids have been associated with medicinal uses for centuries and one of their common biological properties is their cytotoxicity[9]. Flavonoids are hydroxylated phenolic substance known to be synthesized by plants in response to microbial infection and they have been found to be antimicrobial substances against wide array of microorganisms in vitro[10]. Glycosides are known to lower the blood pressure according to many reports[11]. The phenolic compounds are one of the largest and most ubiquitous groups of plant metabolites[12]. Some of the characteristic of saponins include formation of foams in aqueous solutions, hemolytic activity, cholesterol binding properties and bitterness[13,14]. Steroids have been reported to have antibacterial properties[14]. Tannins bind to proline rich protein and interfere with protein synthesis. Terpenoids are widely well known to have expectorant and antitussive activity. Steroids have been reported to possess anti–inflammation activities[15]. The present study attempts to assess the status of phytochemical properties in leaves of medicinal plants to improve the health status of people and also to use in pharmaceutical and nutraceutical products of commercial importance.

Table 1
Preliminary phytochemical analysis for the presence of various phytocompounds

Name of the plant	Solvent type	Alkaloids	Flavonoids	Glycosides	Phenols	Proteins	Saponins	Steroids	Tannins	Terpenoids
Andrographis paniculata	Methanol	-	+	-	-	+	-	+	-	+
	Ethanol	+	+	-	-	-	-	+	+	-
	Acetone	-	-	-	+	+	+	+	+	-
Bixa orellana	Methanol	+	-	+	+	-	-	-	-	-
	Ethanol	+	-	+	+	-	-	-	-	-
	Acetone	+	-	-	+	-	-	-	-	-
Catharanthus roseus	Methanol	-	+	-	-	-	+	+	-	-
	Ethanol	+	+	-	+	-	+	+	+	-
	Acetone	-	-	-	+	-	+	-	-	-
Carcuma longa	Methanol	+	-	-	+	-	-	+	-	+
	Ethanol	+	-	-	-	-	+	+	-	+
	Acetone	-	+	-	-	+	-	-	-	-
Ocimum santrum	Methanol	+	-	+	+	+	+	-	+	-
	Ethanol	+	-	+	+	+	+	+	+	-
	Acetone	+	-	+	+	+	+	+	+	-
Phyllathus niruri	Methanol	+	+	+	+	+	+	+	+	+
	Ethanol	+	+	+	+	+	+	+	+	+
	Acetone	+	+	-	+	-	+	+	+	-
Terminalia bellerica	Methanol	-	+	+	+	+	+	+	+	+
	Ethanol	-	+	+	+	+	+	+	+	+
	Acetone	-	+	+	+	+	+	+	+	+
Terminalia chebula	Methanol	+	+	-	+	+	+	+	+	-
	Ethanol	+	+	-	+	-	+	+	+	-
	Acetone	+	+	-	+	-	-	-	+	-
Tinospora cordifolia	Methanol	+	+	-	+	+	-	+	-	+
	Ethanol	+	+	-	+	+	-	+	-	-
	Acetone	+	+	-	+	+	-	+	+	-

Note: Each datum is the average of two Independent Determinations.

CONCLUSION

This study of the preliminary phytochemical analysis revealed that these phytocompounds are mainly present in the ethanolic extract as compared to methanol and acetone extract as shown in Table 1. So the ethanolic extract of the samples of plant material were found to contain the required major phytocompounds and other nutritive compounds needed by the pharmaceutical companies as well as in food suppliments.

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