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Research Article

QUALITATIVE AND QUALITATIVE PHYTOCHEMICAL SCREENING OF *ACANTHOSPERMUM HISPIDUM* D.C. ROOT EXTRACTS

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ABSTRACT

Phytochemicals have great potency as therapeutic agents. There is continuous and urgent need to discover new therapeutic compounds with diverse chemical structures and novel mechanism of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases. Hence, the present investigation was carried out to assess the phytoconstituents of various root extracts of *Acanthospermum hispidum*. The extracts were subjected to qualitative and quantitative phytochemical analyses as per standard procedures. The results showed that steroids were detected in maximum number of solvent extracts (five among six solvent extracts analysed) followed by alkaloids (in four solvent extracts). Flavonoids, glycosides, phenols, saponins and tannins were absent in all the six solvents used for qualitative phytochemical analyses. Maximum number (five) of compounds were identified in methanol and least (one) in hexane root extract of *Acanthospermum*. Findings of quantitative analyses highlighted that maximum content of alkaloids (4.54 mg/g) were determined in aqueous extract, flavonoids (0.93 mg/g) in methanol, phenols (1.50 mg GAE/g) in aqueous, tannins (0.84 mg TAE/g) in methanol and terpenoids (3.66 %) in methanol extracts. The result of this study is encouraging further clinical studies to determine the potential effectiveness of particular phytochemical *in vivo*.

Keywords: Phytochemical analyses, *Acanthospermum hispidum*, Root extracts.

1. INTRODUCTION

Plant-derived substances have recently become of great interest owing to their versatile applications. Medicinal plants are a group of species that accumulate different active principles, useful in treating various human or animal diseases. They are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs [1].

Phytochemicals are naturally occurring in different parts of the medicinal plants that have defense mechanism and protect from various diseases [2]. The medicinal plants are useful for healing as well as for curing of human diseases because of the presence of phytochemical constituents which produce definite physiological action on the human body and these bioactive substances include alkaloids, carbohydrates, terpenoids, steroids, flavonoids, tannins, etc. [3].

Plants with prospective medicinal activity have recently come to the attention of scientists and researchers because of their bioactive potential. 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. Due to the significance in this above perspective, such preliminary phytochemical screening of plants is the need of the hour in order to discover and develop novel therapeutic agents with improved value. Thus, the present study was aimed to assess the various phytoconstituents present in the six different root extracts of *Acanthospermum hispidum*.

2. MATERIAL AND METHODS

2.1. Plant sample collection

The healthy roots of *Acanthospermum hispidum* belongs to the family Asteraceae and locally called as Kaandhaarimull in Tamil were collected from their natural habitats from coastal region near Athoor (78.0824° E longitude and 8.6106° N latitude) in

Thoothukudi district of Tamil Nadu, India, and brought to the laboratory. The roots were washed thoroughly with tap water and shade dried at room temperature to attain constant weight. The air dried samples were powdered in an electric blender and stored in plastic bags for further analysis. The plant was botanically confirmed and authenticated as per APG IV classification [4].

2.2. Preparation of plant extract

The dried powder material was extracted sequentially in six different solvents viz., acetone, benzene, chloroform, distilled water, hexane and methanol. 15 g of the dried and powdered plant material were separately extracted with 150 ml of acetone, benzene, chloroform, distilled water, hexane and methanol using Soxhlet apparatus for 6-8 hours at a temperature not exceeding the boiling point of the solvents. The obtained crude extracts were filtered by using Whatman No. 1 filter paper and then concentrated under vacuum at 40°C by using a rotary evaporator and later stored at 4°C for further use.

2.3. Qualitative phytochemical analysis

Preliminary phytochemical analyses were carried out on the root extracts of *Acanthospermum hispidum* in order to determine the presence of different phytochemicals like alkaloids, flavonoids, glycosides, phenols, quinones, reducing sugars, saponins, steroids, tannins, terpenoids and triterpenoids by subjecting standard procedures [5-8]. The qualitative results were expressed as (+) for the presence and (-) for the absence of phytochemical.

2.4. Quantitative phytochemical analysis

The content of alkaloids, flavonoids, phenols, tannins and terpenoids were determined as per the methodology of Harborne [7] and the results were expressed as mg/g for alkaloids and flavonoids, mg Gallic Acid Equivalent (GAC)/g for phenols, mg Tannic Acid Equivalent (TAC)/g for tannins and percentage (%) for terpenoids.

3. RESULTS AND DISCUSSION

The results regarding the qualitative phytochemical screening of *Acanthospermum hispidum* root, alkaloids, quinones, steroids, terpenoids and triterpenoids were found to be present in methanol extract, quinones, reducing sugars, steroids and terpenoids were present in chloroform extract, alkaloids, quinones and steroids were present in acetone extract, alkaloids, terpenoids and triterpenoids were present in aqueous extract, alkaloids and steroids were present in benzene extract and steroids in hexane extract. All the six extracts showed the absence of flavonoids, glycosides, phenols, saponins and tannins (Table 1). Most number of phytochemicals (five) were found to be present in methanol extract, followed by chloroform extract (four) and least (one) with hexane extract (Fig. 1).

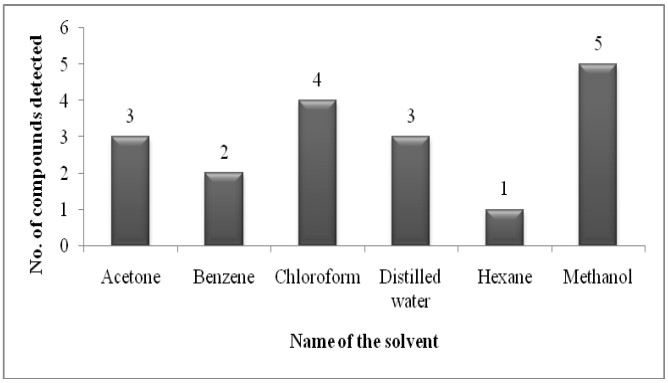

Fig. 1: Number of phytoconstituents detected in six different solvents

Table 1: Qualitative phytochemical screening of *Acanthospermum hispidum* root extracts

Phytoconstituents	Solvent extracts					
	Acetone	Benzene	Chloroform	Aqueous	Hexane	Methanol
Alkaloids	+	+	−	+	−	+
Flavonoids	−	−	−	−	−	−
Glycosides	−	−	−	−	−	−
Phenols	−	−	−	−	−	−
Quinones	+	−	+	−	−	+
Reducing sugars	−	−	+	−	−	−
Saponins	−	−	−	−	−	−
Steroids	+	+	+	−	+	+
Tannins	−	−	−	−	−	−
Terpenoids	−	−	+	+	−	+
Triterpenoids	−	−	−	+	−	+

From the findings of qualitative phytochemical analyses, it was clearly known that most of phytoconstituents were detected in methanol extract than that of other solvent extracts subjected for present study. This is attributable to the higher solubility of the phytocompounds of plant material in methanol than other solvents. Also, the recovery of phytochemicals from plant sample could be influenced by dielectric constant, chemical structure of solvents used, and as well as chemical properties of phytochemicals [9].

For qualitative analyses, four different solvents (acetone, chloroform, distilled water and methanol) were selected and subjected as they were shown maximum number of phytoconstituents present in *Acanthospermum hispidum* root. The results of quantitative phytochemical analyses revealed that maximum (4.54 mg/g) alkaloid content was observed in aqueous root extract of *Acanthospermum hispidum*, followed by methanol (3.54 mg/g) and the least alkaloid content (2.54 mg/g) was detected in acetone extract. In case of flavonoids, highest (0.93 mg/g) content was exhibited in methanolic root extract and lowest (0.16) in aqueous extract. The aqueous extract was found to be had the highest phenol content (1.50 mg GAE/g) and chloroform extract with lowest phenol content (0.16 mg GAE/g). The outcome of present study also indicated that about 0.84 mg TAE/g was determined as maximum tannin content in methanolic extract. Next to this, 0.72 mg TAE/g was detected in acetone extract and 0.55 in aqueous extract as minimum. Among terpenoid content, in methanol extract, it was found to be exhibited at the level of 3.66 %, which was more than that recorded in other solvent extracts (Table 2).

Table 2: Qualitative phytochemical screening of *Acanthospermum hispidum* root extracts

Phytoconstituents*	Solvent extracts			
	Acetone	Chloroform	Distilled water	Methanol
Alkaloids (mg/g)	2.54	3.46	4.54	3.54
Flavonoids (mg/g)	0.62	0.39	0.16	0.93
Phenols (mg GAE/g)	1.26	0.16	1.50	1.04
Tannins (mg TAE/g)	0.72	0.67	0.55	0.84
Terpenoids (%)	2.66	3.06	3.42	3.66

**Values are mean of 3 replicates*

The quantitative phytochemical screening of *Acanthospermum hispidum* root extracts showed that they own their phytoconstituents and such phytochemicals have several important biological activities. It was reported that alkaloids have the pharmacological activities like antimicrobial [10], antiarrhythmic, analgesic [11] and antihyperglycemic [12] activities. It was known that flavonoids possess alpha-glucosidase activity [13], antioxidant activity [14] and anti-inflammatory activity [15]. Phenolic compounds are also known for their anti-inflammatory [16, 17], antimicrobial [18-20], and antioxidant [21, 22] effects. Tannins have been reported to have various physiological effects like anti-irritant, antiparasitic effects [23]. Terpenoids have been found to be useful in the prevention and therapy of several diseases including cancer and possess antimicrobial, anti-parasitic, antiviral, anti-allergenic, antispasmodic, anti-hyperglycemic, anti-inflammatory, and immunomodulatory properties [24-26]. All these research evidences strongly justify the medicinal usage of roots of *Acanthospermum hispidum* as they contained the above mentioned biologically important phytochemicals detected by the present study.

4. CONCLUSION

Further chromatographic studies should be carried out on the phytochemical compounds present in roots of *Acanthospermum hispidum* to isolate, identify, characterize and elucidate the structure of the bioactive compounds. Biological efficacies of the isolated compounds should also be tested using animal models.

Conflict of Interest

The authors have declared that there is no conflict of interest.

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