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Investigation of Phytochemical Properties of *Cardiospermum halicacabum* L. – An Anti-Rheumatic Plant

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Abstract— Plants are an essential source for treating a wide range of human and animal illnesses. As a result, current technologies must be used to scientifically confirm the biological activity of the selected plants. The medicinal plant *Cardiospermum halicacabum* is traditionally used in India and Southeast Asia. It possesses antibacterial, pain-relieving, antibiotic, anti-inflammatory, antioxidant, and anticancer effects, among others. Diabetes, arthritis, limb stiffness, rheumatism, muscle pain, earache, and fever are all popular uses. Due to the solubility of phytocompounds such as polyphenols and flavonoids in various solvents, the type of solvent and polarity have a significant impact on the antioxidant activity of extracts. The main aim of this present study was to screen phytochemical constituents from leaves of *C. halicacabum.* Shade dried plant materials were extracted with petroleum ether, chloroform and methanol by using Soxhlet apparatus until the decolorization of the solvents. Screening of phytochemicals was performed using standard methods and resulted in the detection of the presence alkaloids, flavonoids, phenols, tannins, carbohydrates, saponins, glycosides, protein, amino acid and anthroquinones. To assess their pharmacological potential and identify the structures of the bioactive chemicals responsible for their activities, more research with these plants is needed.

Keywords— *C. halicacabum*, Medicinal plants, Phytochemicals, Alkaloids and Flavonoids

I. INTRODUCTION

Medicinal plants that have since been investigated for biological, antibacterial, and hypoglycemic activities are rich natural resources and are recognized as therapeutically safe medications. They also play an essential part in modern medicine. [1]. Approximately 60% of the world's population still relies on conventional medications for their treatment [2]. Thousands of species have been identified as having medical potential in India, and the usage of various sections of multiple medicinal plants to treat certain illnesses has been practiced since ancient times [3]. Herbal plants have powerful inhibitors that can provide 100 percent outcomes in the treatment of a variety of disorders [4]. Medicinal plants play a significant role in the Siddha, Ayurveda, and Unani systems of medicine due to their ability to treat a variety of diseases. Recent animal experiments have revealed the traditional medicinal system to be a botanical source of medications that have no negative effects on the human body [5].

Phytochemicals are non-nutritive plant compounds that have protective or phytochemical are carbohydrates, amino acids, and the disease prevention process [6]. Herbal medications, often known as plant-based products, are made up of whole plants or plant components that are used to heal injuries or illnesses [7]. Plant-based drugs or are mitigating side effects of synthetic antimicrobials. Herbal extracts have been shown to be effective against multidrug-resistant infections in several studies. Plant secondary metabolites, signal transduction, ligands, hormones, and neurotransmitters all work similarly to endogenous metabolites, signal transduction, ligands, hormones, and neurotransmitters. Medicinal plants are a source of innovative antibiotics, and many choose herbal remedies over synthetic antibiotics because of the negative side effects [8-9].

The *Cardiospermum halicacabum* Linn. belongs to the family *Sapindaceae*, commonly known as 'Balloon vine' or 'Love in a puff'. *Cardiospermum* is the combination of the Latin words cardio, meaning heart, and sperma, meaning seed and refers to the white heart-shaped pattern on the seed [10]. *C. halicacabum* is an annual or perennial herbaceous climber about 200-400 cm height and is found throughout tropical as well as subtropical regions of Asia and Africa, which is consumed as a green vegetable in Indian peninsula. It's commonly used to treat lumbago, rheumatism, neurological illnesses, and as a demulcent in orchitis and edema. The herb has also been used to treat bone fractures, earaches, hardened tumors, hyperthermia, anti-hyperglycaemic, antispasmodic, rheumatism,

lumbago, and snake bites, amongst many other diseases [11-12]. Commercially available plant-derived herbal medicines, such as gel, cream, medicinal drops, and tablets, are effective in treating a variety of chronic skin illnesses, including psoriasis and other skin diseases [13]. Based on this background, the current research was carried out to analyse the phytochemical constituents from chloroform and methanolic leaf extracts of *C. halicacabum*.

II. METHODOLOGY

2.1. Plant Collection and Extraction

The healthy leaves of *C. halicacabum* were collected from Athiyur Village, Kumbakonam, Tamil Nadu, India. The plants were identified and deposit herbarium at Department of Botany, Government Arts College (Autonomous), Kumbakonam, Tamil Nadu, India. The plant materials shade dried for one week and powdered for the further studies. In 100g of powdered sample of leaves and flower sample of *C. auriculata* were extracted successively with 250 ml petroleum ether, chloroform, and Methanol using soxhlet extractor and the extracts were stored at 4°C in air tight container for further analysis.

2.2. Phytochemical screening of extracts

Chloroform and methanolic leaf extracts were used for preliminary phytochemical analyses followed by Deshmukh and Theng (2018) [14]. The following qualitative tests for both the metabolites were done as follows:

2.2.1. Test for alkaloids

About 10 mg of leaf extract was taken and few drops of Wagner's reagent was added and the formation of a reddish-brown precipitate indicates the presence of alkaloids.

2.2.2. Test for flavonoids

In 10 mg of leaf extract was taken and few drops of 10% lead acetate solution was added. Appearance of yellow colour precipitate indicates the presence of flavonoids.

2.2.3. Test for phenols

In 0.5 g of extract was dissolved in 0.5 ml of 20% sulphuric acid solution. Followed by addition of few drops of aqueous sodium hydroxide solution, it turns blue which indicates the presence of phenols.

2.2.4. Test for tannins

In 5 mg of extract was taken and 0.5 ml of 5% ferric chloride was added. The development of dark bluish black color indicates the presence of tannins.

2.2.5. Test for carbohydrates

In 5 ml of Fehling's solution was added to 0.5 mg of bark extract and boiled in a water bath. The formation of yellow or red precipitate indicates the presence of reducing power.

2.2.6. Test for saponins

In 0.5 g of leaf extract was taken in a test tube and few drops of 5% sodium bicarbonate solution was added. The mixture was shaken vigorously and kept for 3 min. Formation of honeycomb like froth shows the presence of saponins.

2.2.7. Test for glycosides

In 0.5 mg of extract was dissolved in 1 ml of water and then aqueous NaOH solution was added. Formation of yellow color indicates the presence of glycosides.

2.2.8. Test for protein

To 0.5 g of extract equal volume of 40% NaOH solution and two drops of 1% copper sulphate solution was added. The appearance of violet colour indicates the presence of protein.

2.2.9. Test for Amino acids

About 0.5 g of extract was taken and 2 drops of freshly prepared 0.2% ninhydrin reagent were added and heated. The appearance of pink or purple colour indicates the presence of proteins, peptides or amino acids.

2.2.10. Test for anthraquinone

About 0.5 g of the leaf extract was taken into a dry test tube and 5 ml of chloroform was added and shaken for 5 min. The extract was filtered and the filtrate was shaken with an equal volume of 10% ammonia solution. A pink violet or red colour in the lower layer indicates the presence of anthraquinone.

III. RESULTS AND DISCUSSION

In the present study, chloroform and methanolic leaf extracts of *C. halicacabum* was analysed for the phytochemical constituents. The presence of alkaloids, flavonoids, phenols, tannins, carbohydrates, saponins, glycosides, protein, amino acid and anthroquinones was determined (Table 1). The alkaloids, phenols, tannins, carbohydrates and saponins are present in both of two extract, while flavonoids, proteins, amino acid and anthroquinones are found in only on methanolic extract. The glycosides are present only on chloroform extract. The choice of a suitable solvent is critical for bioactive compound recovery. Polyphenols, carbohydrates, terpenes, and organic molecules may all be extracted using methanol as a solvent [15]. The phytochemical content in *Cardiospermum halicacabum* ethanolic extract, the presence of phytochemicals was correlated with our results [16]. Deepan et al., (2012) reported that the phytochemical screening of *C. helicacabum* revealed the presence of alkaloids, carbohydrates, proteins and saponins [17]. The flavonoids isolated from chloroform extract of *C. halicacabum* has been shown to have anticancer properties while having little hematolytic effects. [18]. The presence of phenolic chemicals, which are known to inhibit pro-oxidant enzymes, successfully inhibited xanthine oxidase in silk worms [19].

Table 1. Phytochemical properties of leaf extract of *Cardiospermum helicacabum* L.

Sl. No	Phytochemical	Extract	
		Chloroform	Methanol
1	Alkaloids	Present	Present
2	Flavonoids	Absent	Present
3	Phenols	Present	Present
4	Tannins	Present	Present
5	Carbohydrates	Present	Present
6	Saponins	Present	Present
7	Glycosides	Present	Absent
8	Proteins	Absent	Present
9	Amino acids	Absent	Present
10	Anthroquinones	Absent	Present

IV. CONCLUSION AND FUTURE SCOPE

The phytochemical analysis of *Cardiospermum halicacabum* showed positive in all aspects. This may be due to the presence of various compounds present in *C. halicacabum* and this may be the source for the wide activity of the plant against such activities. The present study reveals the potentiality of the plant taken for the study and extensive study with a particular area of focus in future may form a basis for a new drug discovery.

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