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ASSESSMENT OF PHYTOCONSTITUENTS AND ANTIMICROBIAL ACTIVITY OF CARDIOSPERMUM HALICACABUM L.

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ABSTRACT

Experiments were carried out to evaluate various nutritional, phytochemical constituents and antibacterial activity of ethanolic and hexane extract of *Cardiospermum halicacabum* L. Results revealed that the plants which are good sources of nutrients and having potential antibacterial activity against human pathogens. Antibacterial screening of ethanolic and hexane extract of *Cardiospermum* leaves provided inhibition role against *Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa* and *Staphylococcus aureus* and the presence of various macro and micro nutritions which acts as dietary supplement to enrich our health, immunity and also used for the treatment of various microbial infections.

Keywords: Antibacterial activity, Phytochemicals, Nutrients, Pathogens, Cardiospermum halicacabum L.

1. INTRODUCTION

The study plant *Cardiospermum halicacabum* Linn. is an annual or perennial climber, widely distributed in tropical and subtropical Africa and Asia. *C. halicacabum* has been examined for antidiarrheal as well as homoeopathic medicinal properties. It has been used in the treatment of rheumatism, nervous diseases, stiffness of the limbs and snakebite. Young leaves can be cooked as vegetables [1]. *Cardiospermum halicacabum* possesses various phytochemicals and active biomolecules, which play a major role in the treatment of cancer. Many plants have been examined to identify new and effective anticancer compounds, as well as to elucidate the mechanism of cancer prevention and apoptosis [2].

Other secondary metabolites reported include alkaloids, carbohydrates, proteins, saponins lignin, steroids, cardiac glycosides found in small quantities in the extracts [3]. The plant possess activities like antimicrobial, antifungal, antiparasitic, antidiarrheal, anxiolytic, antipyretic and management of painful, arthritic inflammatory conditions [4]. Plant crude extracts were containing large amount of natural antioxidants, which are used as folkloric medicines [5]. Acetone, alcohol, benzene, chloroform and aqueous extracts of leaf and stem were used for phytochemical screening and antimicrobial activity. Phytochemical studies indicated that the leaf and stem contain a broad spectrum of secondary metabolites. Acetone extracts of stem showed maximum inhibitory action against S. typhi and benzene extracts of stem had moderate inhibitory action against Escherichia coli [6]. The features of Cardiospermum halicacabum was investigated for their phytochemical and antibacterial activity [7]. Alkaloids & flavonoids have been used as antiviral, antibacterial, antiamoebial & anticancer agents. Phenolic and polyphenolic are the other group of secondary metabolites [8]. The uses of plant-derived products as disease control agents have been studied, since they tend to have low mammalian toxicity, less environmental effects and wide public acceptance [9]. The plant extract showed significant activity against the bacterial pathogens and this may be due to the presence of various compounds. The antioxidant activity also notably significant and anticancer study revealed the importance of the study plant as a potential anticancer agent [10]. The roots, leaves, stem, and seeds of this plant are employed as herbal medication. The phytochemical analysis confirmed that this herb contains flavonoids, terpenoids, tannins, saponin, protein, carbohydrates,

glycosides, variety of fatty acids, and volatile esters. Due to the presence of various compounds, this plant has antibacterial, antifungal, antiparasitic, antidiarrheal, anxiolytic, antioxidant, antipyretic, antirheumatic, anticonvulsant, anti-inflammatory, and anticancinogenic activities [11]. Cardiospermum halicacabum is one of the medicinally potential plants which is used in the treatment of rheumatism, lumbago, cough, hyperthermia, and nervous diseases [12]. Thus, the main objective of the work was to analyze the chemical constituents and to evaluate the antimicrobial activity of the ethanolic and hexane leaf extract of *C. halicacabum*.

2. MATERIALS AND METHODS

2.1. Collection of plant material

The plant material for the present investigation was collected from the field areas of Karur, Tamil nadu, India.

2.2. Extraction process

Plant material was successfully extracted in redistilled aqueous and ethanol by maceration at room temperature (29°C) for 72 hours respectively. Percentage yields were calculated after removal of solvent and the result in plant extracts were stored in the refrigerator till needed for analysis [13].

2.3. Analysis of Phytoconstituents

Preliminary phytochemical constituents such as carbohydrates, protein, alkaloids, flavonoids, steroids, tannin, plenols, Cardiac glycosides and sulphur were analysed qualitatively by the method prescribed [14].

2.4. Antibacterial activity of the leaves of *Cardiospermum halicacabum* L.

2.4.1. Pathogenic bacteria

In vitro an Antibacterial activity was examined by hexane and ethanol extract from the leaves of *Cardiospermum halicacabum* L. and microorganisms were obtained from the Department of Microbiology, Sri Paramakalyani College, Alwarkurchi, Tirunelveli, Tamilnadu, India. Amongst four microorganism investigated, one gram positive bacteria was *Staphylococcus aureus* while three gram negative bacteria were *Klebsiella pnemoniae*, *Psedomonas auruginosa* and *Escherichia coli* all the microorganisms were maintained at 4°C on nutrient agar slants.

2.4.2. Media preparation and antibacterial activity

Ethanol and hexane extract from the leaves of *Cardiospermum* were analysed against four pathogenic bacterial strains by disc diffusion method [15]. The molten Muller Hinton agar was inoculated with the 100µl of the inoculum (1x 10^8 CFU/ml) poured into the sterile petri plates. 20ml of sterilized nutrient agar medium for *Pseudomonas auruginosa, Staphylococcus aureus, Escherichia coli* and *Klebsiella pnemoniae* were poured into each sterile petridish. After solidification, the sterile

cotton swab was dipped into the both of these bacteria. The entire agar surface of each plate was inoculated with this swab, first in the horizontal direction and then in a vertical direction, which ensure the even distribution of organism over the other surface. The sterile filter pare discs (6 mm in diameter), soaked in the plant extracts were placed on the surface of the bacteria seeded agar plates and then plates were incubated at $37^{\circ}C$ for 24 hours. A standard disc containing chloramphenicol antibiotic drug ($25\mu g/$ disc) was used as a positive control for the comparison of the Antibacterial activity of the sample and also a blank disc/ plain disc was used as a negative control.

3. RESULT AND DISCUSSION

3.1. Phytochemical analysis

Phytochemical analysis and anti-microbial activity of ethanolic and hexane extract of the traditional drug source was carried out. Table 1 indicates the phytoconstituent of the ethanolic and hexane extract of leaves of *Cardiospermum halicacabum* L. when subjected to qualitative analysis for alkaloids, flavonoids, tannin, phenol, sulphur, steroids, gums and mucilage, saponins, protein and carbohydrate.

Table 1: Phytochemical constituents in ethanolicandhexaneextractsofCardiospermumhalicacabum l.

Phytochemical	Extracts of C. halicacabum L.			
constituents	Ethanol	Hexane		
Alkaloids	+	+		
Flavonoids	+	+		
Tannins	+	+		
Steroids	+	+		
Phenol	+	+		
Sulphur	+	+		
Gums and mucilage	-	-		
Cardiac glycosides	+	+		
Saponins	+	+		
Protein	+	+		
Carbohydrate	+	+		

All the tested phytoconstituents were found to be present in the aqueous and methanolic extracts of leaves of *Cardiospermum*. Only difference is absence of steroids, gums and mucilage in both the extracts. Alkaloids have analgesic, antispasmodic and bactericidal effect and this is the basic for the use as basic medicinal agent [16]. The alkaloids identified in this study may function to control threatened miscarriage through these processes. The analgesic properties may help to relieve pain in the lower back and abdomen; the antispasmodic properties may relieve cramps which may accompany bleeding from the uterus while their bactericidal effect may help to control infection.

In particular, aqueous, methanol and heptane leaves and stem extracts of *C. halicacabum* represent maximum antidiabetic activity. This effect may be due to the presence of various phytoconstituents present in the leaves which could act independently in enhancing the inhibition activity of intestinal carbohydrate digestive enzymes [17]. The Phytochemical studies indicate that the leaf, seed coat and stem contain a broad spectrum of secondary metabolites. Flavonoids, Terpenoids and cardiac glycosides were predominantly found in all the three tested solvent extracts of leaf followed by Tannin, Flavonoids, Terpenoids and cardiac glycosides [18].

3.2. Antimicrobial activity

The antibacterial activity of ethanol and hexane extracts of leaves Cardiospermum comparable of standard antimicrobes, Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa and Staphylococcus aureus at four different concentrations (10 µg, 20µg, 30µg and 40µg) in Table 2 & 3. The hexane extract were most active against gram negative bacteria. The antibacterial activity of ethanol extract of Cardiospermum the extract shows the inhibition of decreasing order as mentioned. Order of susceptibility of the bacteria to the extracts: Escherichia >Pseudomonas coli aeruginosa >Staphylococcus aureus>Klebsiella pneumonia. The antibacterial activity of hexane extract of Cardiospermum the extract shows in inhibition of decreasing order as mentioned. Order of susceptibility of the bacteria to the extracts is Klebsiella pneumonia>Escherichia >Staphylococcus coli aureus>Pseudomonas aeruginosa.

Microorgnisms	Standard (mm) (Chloramphenicol)	Zone of inhibition in different concentrations (mm)			
		10µg	20µg	30µg	40µg
Klebsiella pneumonia	16	7	9	10	11
Escherichia coli	15	10	11	12	15
Pseudomonas aeruginosa	24	8	10	12	14
Staphylococcus aureus	18	7	9	10	13

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Microorgnisms	Standard (mm) (Chloramphenicol)	Zone of inhibition in different concentrations (mm)			
		10µg	20µg	30µg	40µg
Klebsiella pneumonia	22	11	13	15	17
Escherichia coli	15	7	11	12	15
Pseudomonas aeruginosa	16	7	8	9	11
Staphylococcus aureus	17	8	9	10	14

Table 3: Anti-bacterial activity of Hexane extracts of Cardiospermum halicacabum

The pharmacognostical and phytochemical evaluation of Cardiospermum halicacabum L. stem can provide useful information for identification and authentication of plant [19]. The present study reports the antimicrobial activity of C. halicacabum. The GC-MS analysis of ethanolic extract of C. *halicacabum* reveals the presence of The antimicrobial phytochemicals. observed antimicrobial activity confirms the effectiveness of traditional use of this herbal drug against microbes [20]. Antibacterial activity of Cardiospermum halicacabum was examined against clinical human bacterial pathogens. The butanol and methanol extract of *C. halicacabum* was endowed with plenty of phytochemical compounds [21]. Phytochemical analysis of three extracts showed that the presence of alkaloids, tannins and flavonoids. Methanol extracts were found to contain more phytochemical constituents compared to aqueous and petroleum ether extracts. The methanol extract of aerial parts were found to be exhibit highest zone of inhibition against *S. aureus*, *P. florescence* and *K. pneumonia* [22]. Ethanol and methanol extracts were most effective followed by other aqueous extract. The aqueous, acetone and methanol extracts from the leaves and stem of *Cardiospermum helicacabum* L. exhibited antimicrobial and antifungal activity against *Aspergillus niger* and *Aspergillus flavus* [23]. Phytochemicals have been used to treat chronic as well as infectious diseases. Many pharmacological studies have been done with various parts of *C. halicacabum* plant to demonstrate its medicinal effect. The active compounds were isolated from the leaf extract of *C. halicacabum* [24].

4. CONCLUSION

The results of this study revealed that the wide variety of foods were used to meet nutritional needs and that native plants cultivation and improving techniques leads to increased production of plants rich sources. Qualitative phytoconstituents analysis of the aqueous and methanolic extract of Cardiospermum halicacabum L. contains carbohydrates, protein, flavonoids, phenols, steroids, alkaloids, gums and mucilage, saphonins, sulphur and cardiac glycosides. Antibacterial screening of aqueous and methanolic extract of Cardiospermum leaves provide inhibition role against Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa and Staphylococcus aureus. This study concluded that the presence of various macro and micro nutrition which acts as dietary supplement to enrich our health and immunity and it also used for the treatment of various microbial infections.

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