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Assessment of phytoconstituents, nutrients and antibacterial activity of *Cardiospermum halicacabum* Linn

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ABSTRACT

The present study is used to investigate the presence of Phytoconstituents, nutrients and antibacterial activity of *Cardiospermum halicacabum* Linn. Phytochemical analysis of leaf material revealed that antibacterial activity of plant material is because of the presence of phenolic compounds. Macroelement calcium and microelements iron were observed in high amount through Flame Emission Spectroscopy and Atomic absorption Spectroscopy respectively. Ethanol and hexane extracts from *Cardiospermum halicacabum* were investigated for their invitro antibacterial properties against 4 bacterial pathogens like *Pseudomonas aeruginosa, Staphylococcus aureus, Escherichia coli,* and *Klebsiella pneumoniae*. The results obtained in the present study suggested that *Cardiospermum halicacabum* were more active against gram-negative bacteria.

Key words: Medicinal plant**,** *Cardiospermum halicacabum,* phytochemical, nutritive value, antibacterial activity.

INTRODUCTION

Cardiospermum halicacabum Linn. (Sapindaceae) is an herbaceous climber found throughout the plains of India (Joshi et al., 1992). This plant, commonly known as "Kanphuti", is used in Ayurveda and folk medicine for the treatment of rheumatism, lumbago, earache and fever (Nadkarni, 1976). The whole plant has been used for several centuries in the treatment of rheumatism, stiffness of the limbs, snake bite, its roots for nervous diseases, as a diaphoretic, diuretic, emetic, emmenagogue, laxative, refrigerant, stomachic and sudorific; it leaves and stalks are used in the treatment of diarrhoea, dysentery and headache and as a poultice for swellings. (Pharmacology Magazine, vol.4). Phytochemical constituents such as flavone aglycones, triterpenoids, glycosides and a range of fatty acids and volatile esters have been reported from the extracts of this plant. However the plant has not been experimentally tested for its diuretic property. Most of the Phytomedicines used is conventional medical practice today were discovered through the ethnobotanical route and about 74% of drugs developed from higher plants which currently in the market were actually derived from the indigenous knowledge of traditional people on ethnomedicines (Mugabe, 1999).

In recent years, secondary plant metabolites (phytochemicals), previously with unknown pharmacological activities, have been extensively investigated as a source of medicinal agents. Thus, it is anticipated that phytochemicals

with adequate antibacterial efficacy will be used for the treatment of bacterial infection (Tanaka H, 2002).

Nutrition surveys have shown the widespread occurrence of dietary diseases. Anemias due to deficiencies of iron, Folic acid, Vitamin B_{12} are fairly common among expectant and nursing mothers. (Mengal and Krikby, 1982). Conservation and sustainable use of the genetic resources of indigenous food crops offer a tremendous food for addressing the problem of food securely both quality and quantity. There is a lack of knowledge about Nutritive value and cooking methods that minimize nutrient leaching during food preparation (Muckle, 1993).

Several bacterial infections are associated with the risk of certain cancer, and viruses are now recognized as the second most important cause of human cancer. Many chemicals are produced in plants as antimicrobial and antiviral agents, these compounds are being examined for their potential to inhibit human pathogens. (De M, Krishna De A, Banerjee AB 1999).

MATERIAL AND METHODS

Collection of plant material

The Plant material for the present investigation was collected from the field areas of Kumbakonam, Thanjavur District, Tamilnadu, India.

Plant extraction

Plant materials were successively extracted in redistilled aqueous and methanol by maceration at room temperature (29°C) for 72 hours respectively. Percentage yields were calculated after removal of solvents and the resulting plant extracts were stored in the refrigerator till needed for analysis (Ajaiyeoba, 2000).

Phytochemical investigation

The preliminary phytochemical screening was carried out for carbohydrate, protein, alkaloids, flavonoids, steroids, gums and mucilages, saponins, tannins and phenols, cardiac glycosides and sulphur. The constituents were analyzed quantitatively by the method of (kokate *et al*., 1995).

Nutritional value

Macroelement determinations of *Cardiospermum halicacabum* were analyzed using Flame Emission Spectroscopy that subjected to analysis of Na, K and Ca. Trace element analysis of *Cardiospermum halicacabum* were quantitatively determined using Atomic Absorption Spectroscopy method of Mayer and Keliher (1992). This method quantitatively determined a variety of other elements utilizing a Nitricacid/hydrogen peroxide microwave digestion and determination. This method has the detection limits ranging from 0.1mg kg^{-1} to 0.01 mg kg^{-1}.

Collection of pathogenic microorganism

Invitro antibacterial activity was examined for hexane and ethanol extracts from the leaves of *Cardiospermum halicacabum*. The pathogenic bacterial consortiums were obtained from the vaishnavi medical Laboratory, Kumbakonam, Tamilnadu India. Amongst four microorganisms investigated, one gram-negative bacterium were *Klebsiella pneumonia, Pseudomonas aeruginosa and Escherichea coli* all the microorgamsms were maintained at 4°c on nutrient agar slants.

Antibacterial assay

The antibacterial assay was performed by disc diffusion method for ethanol and hexane extracts of *Cardiospermum halicacabum*. The molten muller hinton agar (Hi-media) was inoculated with the 100µl of inoculums ($1x10^8$ CFU/ml) poured into the sterile petri plates (Hi-media). 20ml of sterilized nutrient agar medium for 4 bacterial species were poured into each sterile petridish. After solidification, the sterile cotton swab was dipped into the broth 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 agar surface. The sterile filter paper discs (6mm in diameter) Soaked in the plant extract with various concentration were placed on the surface of the bacteria seeded agar plates and then the plates were incubated at 37°C for 24 hr.

A standard disc containing chloramphenicol antibiotic drug (25ug/disc) was used as a positive control for comparison of the

antibacterial activity of the sample and also a blank disc/plain disc was used as a negative control (Bauer *et al*. 1966)

RESULTS AND DISCUSSION

The antibacterial activity of *Cardiospermum halicacabum* extracts was assayed invitro by agar disc diffusion method against four bacterial pathogenic species. The result showed that in both ethanol and hexane extracts of the plant gives the maximum antibacterial activity was analyzed in gram-negative bacteria such as *klebsilla pneumoniae* and *Pseudomonas aeruginosa.* The maximum inhibition zones and MIC values for bacterial strains of ethanol and hexane extracts were in the range of 16-21mm and 22-40 ug/ml; 14-22 mm and 20-40 ug/ml respectively (table1). Based on these results, hexane extract as stronger and broad spectrum of antimicrobial activity compared with ethanol extract. In both the Ethanol and Hexane extracts of the plant the maximum antibacterial activity was shown by the Gram-negative bacteria *klebsilla pneumoniae* followed by *Pseudomonas aeruginosa*. Similar results were also reported by venkatesan et al, Prescott *et al* and stains et al, who reported diseases such as pneumonia, urinary and respiratory tract infection caused by *Klebsiella* species. The significant antibacterial activity of the active plant extracts was comparable to the standard chloramphenicol.

The phytochemical analysis of solvent ethanol and hexane extracts revealed the presence of alkaloids in large amount and other secondary metabolites like flavonoids, tannin, lignin, glycosides and serpentines in trace amounts (fig. 1). The potential for developing antimicrobial from plants appears rewarding, as it will lead to the development of phytomedicine to act-against microbes. Plant-based antimicrobials have enormous therapeutic potential as they can serve

Table 1: Antibacterial activity of ethanol and hexane extract of *Cardiospermum halicacabum* leaves

S. No.	Tested Bacterial Pathogens	Standard (Chloramphenicol) Zone of inhibition (mm)	Zone of inhibition in different concentration (mm)							
			Ethanol				Hexane			
			10µg	20µg	30µg	40µg	10µg	20µg	30µg	40µg
1	Klebsiella Pneumoniae	20	14	16	18	21	12	14	16	22
2	*Pseudomonas aeruginosa*	22	12	14	16	23	10	11	14	24
3	*Escherichia coli*	19	11	13	15	20	12	14	15	18
4	*Staphyloccus aureus*	24	12	14	18	25	08	12	11	17

Table 2: Macroelements in *Cardiopermum halicacabum* by using flame emission spectroscopy (FES)

S. No.	Macroelements	*Cardiospermum halicacabum* (%)
1	Total Potassium	1.59
2	Total Sodium	0.28
3	Total Calcium	2.48

Table 3: Micronutrients in Cardiospermum halicacabum by a tomic absorption spectroscopy (AAS)

S. No.	Macroelements	*Cardiospermum halicacabum* (%)
1	Total Zinc	1.30
2	Total Copper	0.21
3	Total Iron	75.72
4	Total Manganese	12.78
5	Total Boron	1.02
6	Total Molybdenum	0.12

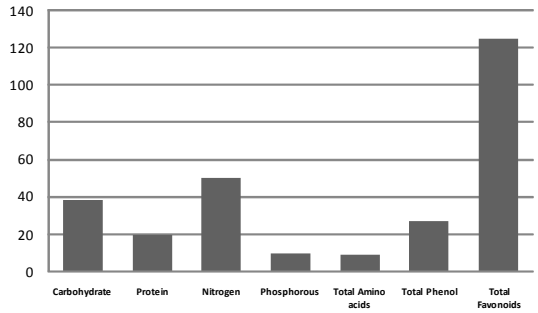

Fig. 1: Preliminary phytocochemical analysis of *Cardiospermum halicacabum* leaves

the purpose with lesser side effects that are often associated with synthetic antimicrobials (Iwu *et al* 1999).

The presences of the macroelement in *Cardiospermum halicacabum* leaves are found to contain calcium in high amount. Calcium helps to maintain a regular heartbeat and regulates blood pressure calcium is the most abundant macroelement in the plant Table 2. Normal extra cellular calcium concentrations are necessary for blood coagulation and for the integrity, intracellular cement substances (okaka and okaka 2001). Table 3 reveals the presences of the microelements in *Cardiospermum halicacabum* leaves are found to contain Iron in high amount. Iron is important in the formation of hemoglobin, the oxygen carrying factor in Red blood cells, without it the body could not make ATP to produce DNA. Iron has shown to improve restless legs syndrome; is necessary for the proper metabolism of eight vitamins prevents anemia and fatigue; promotes good skin tone, and stimulates the immune system decrease the craving for alcohol (Kadans and Joseph, 1984).

In conclusion, *Cardiospermum halicacabum* extracts possess various macro and micronutrient that act as a dietary supplement to end reach our health and Immunity. *Cardiospermum halicacabum* also used for the treatment of various microbial Infection.

REFERENCES

1. Joshi, S.K., Sharma, B.D., Bhatia, C.R., Singh, R.V., Thakur, R.S. The Wealth of India Raw materials, Council of Scientific and Industrial Research Publication, New Delhi, **3**: 270-271 (1992).
2. Nadkarni, K.M., Indian Materia Medica. Popular Book Depot, Bombay, 271 (1976).
3. Mugabe, J. Intellectual property protection and traditional knowledge. An exploration in international policy discourse. 2nd edn., ACTS press Nairobi, Kenya, 106-109 (1999).
4. Mengel, K. and Krikby, E.A. Principles of Plant Nutrition. J.Ethnopharmacol, 8:265-275, (1982).
5. Muckle, M.E. , *Hydroponic nutrients. J. Bio. Chem.*, **102**: 156-161 (1993).
6. DeM, Krishna De A, Banerjee AB. Antimicrobial screening of some Indian species. *Phytother Res.,* **13**: 616-8 (1999).
7. Ajaiyeoba, E.O. Phytichemical and antimicrobial studies of Gynandropsin gynandra and Buchholzia coriaceace extracts. *African J. Biochemical research*, **3**: 161-165 (2000).
8. Mayer, G.A. and Keliher, P.N. An Overview of analysis by inductively coupled Plasma-Atomic Emission Spectroscopy. Springer-Verlag, Newyork. 473-516 (1992)
9. Bauer, A.W., Kirby, W.M.M, Sherris, J.C. and Turck, M. Antibiotic susceptibility testing by standardized single disk method. *American J.Clin. Pathol.,* **45**: 493-496. (1966).
10. Lwumw. Duncan Ar, okunji Co. New antimicrobials of Plant origin. In: Janick J.ed. Perspectives On New crops and New uses. Alexandria, VA: ASHS Press:: 457-462 (1999).
11. Okaka, J.C. and Okaka, N.O. Food composition, spoilage and shelf life extension ocjarco Academic Pub, **12**: 54-56 (2001).
12. Kokate, K., Lakshmiah, R. and Ramasastu, M. Chemical components of Plants. *J. Nutrition and Dietetics*, **6**: 200 (1995).
13. Kadans and Joseph. Encyclopedia of Medicinal herbs. Arco publishing **8**: 25-28 (1984).