Smithi R, et al., J Food Sci Nutr 2024, 10: 185
DOI: 10.24966/FSN-1076/100185

HSOA Journal of Food Science and Nutrition

Research Article

Phytochemical and Nutrient Composition of Fresh and Dried *Cardiospermum Halicacabum* Leaves

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Abstract

Cardiospermum halicacabum is a creeping herbaceous plant which propogates easily. *Cardiospermum halicacabum L*. belongs to family Sapindaceae. This plant is produced in the plains of Africa, America, Bangladesh, India and Pakistan. Its general names include: balloon vine, heart vine, heart pea, love-in-a-puff heart and Kanphuti. Its vernacular name (Tamil) is Mudakkathan. Its extract decreases body. For many years, the entire plant has been used to cure limb stiffness, rheumatism, and snake bites. It is used for the treatment of rheumatism and stiffness of limbs. It has also been found effective in treating arthritis, lumbago, cough and some nervous diseases. Aim of the study was to process the fresh and dried *Cardiospermum halicacabum* leaves; to extract the fresh and dried *Cardiospermum halicacabum* leaves; to estimate phytonutrient of fresh and dried *Cardiospermum halicacabum* leaves; and to estimate nutrient composition of fresh and dried *Cardiospermum halicacabum* leaves. *Cardiospermum halicacabum* leaves are were selected for its nutrient content. The Phytochemicals present in fresh and dried *Cardiospermum halicacabum* leaves were analysed using different solvents of Ethanol, Acetone, Aqueous, Chloroform with standard procedure. The analysis of nutrients present in the products were done by AOAC method. The phytochemical analysis shows the presence of tannins, terpenoids, steroids, flavonoids, alkaloids and saponins in fresh and dried *Cardiospermum halicacabum* leaves. The leaves are rich in calcium and iron, vitamins and minerals.

Keywords: Lumbago; Phytochemical; Rheumatism; Sapindacae

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Citation: Smithi R, Bharathi K, Rani DJ (2024) Phytochemical and Nutrient Composition of Fresh and Dried *Cardiospermum Halicacabum* Leaves. J Food Sci Nutr 10: 185.

Received: April 17, 2024; **Accepted:** May 28, 2024; **Published:** June 05, 2024

Introduction

Cardiospermum halicacabum of the sapindacea family is a creeping herbaceous plant which propogates easily. The morphological characteristics of the plant are the preconditions for the scientific denomination. From Latin, "*Cardiospermum*" means heart-shaped seed, while "*halicacabum*" means container for salt. In the German language, the plant is known as "herzsamen"; in Tamil it is known as "Moda kathan", i.e., disabling pain and remedy; in North America it is referred to as "balloon vine" (that is, climbing balloon) due to the fact that the plant is a creeper and produces globose capsules similar to small balloons. Plant-based drugs have been used globally for healing different illnesses in conventional systems of medicines. Around 80% of world's population still depends on medicinal plants for their primary health care needs especially where modern medicines are not accessible. Eco-friendly and bio-friendly plant-based commodities have recently been given consideration for the prevention and treatment of various human infections including microbial diseases throughout the world and employment of plants in ethno medicine is on rise worldwide. *Cardiospermum halicacabum L.* belongs to family Sapindaceae. This herbaceous plant is extensively dispersed in tropical and subtropical areas of the world. This plant is produced in the plains of Africa, America, Bangladesh, India and Pakistan. Its general names include: balloon vine, heart vine, heart pea, love-in-a-puff heart and Kanphuti. Its vernacular name (Tamil) is Mudakkathan. Its extract decreases body ache. The plant based herbal products like gel, cream, shampoo, spray etc. are present in the market and are helpful in dry itchy skin and scalp flavones, aglycones, triterpenoids, glycosides and a variety of fatty acids and volatile esters. Other secondary metabolites reported include alkaloids, carbohydrates, proteins, saponins lignin, steroids, cardiac glycosides found in small quantities in the extracts. Over a period of 70 years, the cortisonic effects of this plant were discovered. Subsequently, the plant was the subject of study by many researchers who were driven by the importance it had among poor populations and experimentally highlighted its phyto therapeutic properties in rural areas of southern India, this plant is sold in local markets as a green vegetable and provides a source of income for poor families. This plant is grown on the plains of Bangladesh, India, Pakistan and America. For many years, the entire plant has been used to cure limb stiffness, rheumatism, and snake bites. Its root has also been employed as a diuretic, emetic, emmenagogue, laxative, and a remedy for nerve disorders. Appreciable progress has been noticed in the usage of plants and plant-derived products as drugs against arthritis, diabetes mellitus, cancer, cardiovascular diseases, and neurodegenerative disorders owing to their low toxicity and lesser side effects. The whole plant has been used for several centuries in the treatment of rheumatism, stiffness of the limbs, and snake bite; the decoction from its roots is used as a diaphoretic, diuretic, emetic, laxative, and for sweating; the decoction of its leaves and stems is used in cases of diarrhoea, dysentery, and headaches; a poultice of them as a cure for swelling. The juice of the leaves has even been used as a treatment for earache [1-7].

Objectives

- To process the fresh and dried *Cardiospermum halicacabum* leaves;
- To extract the fresh and dried *Cardiospermum halicacabum* leaves;
- To estimate phytonutrient of fresh and dried *Cardiospermum halicacabum* leaves;
- To estimate nutrient composition of fresh and dried *Cardiospermum halicacabum* leaves.

Materials and Methods

Selection and Collection of *Cardiospermum Halicacabum* Leaves

Cardiospermum halicacabum leaves are were selected for its nutrient content. The leaves were collected from Sitra market, Coimbatore. As the leaves are rich in antioxidants, calcium and iron, we are taking this leaves as a main ingredient. The leaves of this plant are used to prepare an infusion or decoction which is taken orally to treat diarrhea, dysentry, gonorrhea, leprosy, syphilis, tuberculosis, and venereal diseases. Mudakathan is used in Indian traditional medicine system for the treatment of rheumatism and stiffness of limbs. It has also been found effective in treating lumbago, cough and some nervous diseases. It gives noticeable relief in patients of arthritis, joint pain and even gout patients.

Processing of Fresh *Cardiospermum Halicacabum* Leaves

100 grams of fresh *Cardiospermum halicacabum* leaves were kept in a cabinet dryer for 3 hours at 60 degree Celsius. After dried 25 grams of dried leaves were obtained. Then the dried *Cardiospermum halicacabum* leaves were put in a mixie jar and grind well. The powder wassieved and then stored in a zip lock cover for further use (Figure 1).

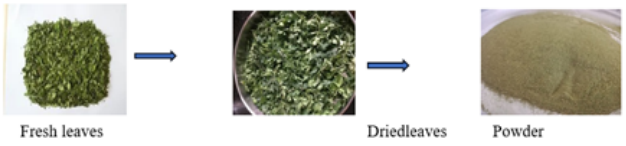

Figure 1: Phytochemical analysis of fresh and dried *Cardiospermum halicacabum* leaves.

Extraction Method

Extraction is done by using maceration method. Maceration is one of the simplest extraction techniques in which coarse and powdered plant material is soaked in solvents such as methanol, ethanol, ethyl acetate, acetone, hexane etc. It is one of the popular and inexpensive techniques used for the extraction of different bioactive compounds from plant material. Maceration process consists of grinding of plant material into smaller particles to increase the surface area for easy mixing with solvent and efficient extraction of compounds. Then this mixture of plant material and solvent is kept for longer time, agitated at different intervals and filtered through a filtration medium. The efficiency for the removal of bioactive compounds from the plant material depends on the type of solvent and type of plant material. The polarity of solvent is the important parameter affecting the extraction efficiency. In this method different solvents and time-temperature combinations are used for efficient extraction. Maceration raptures the cell structure and expose the chemical constituents to react with the solvent and helps in removal of different plant components. This method is extensively used for the extraction of different types of bioactive compounds at laboratory scale.

Phytochemical Analysis of Fresh Leaves Extraction Method

Phytochemicals are chemicals of plant origin. Phytochemicals are chemicals produced by plant through primary or secondary metabolism. They generally have biological activity in the plant host and play a role in plant growth or defense against competitors, pathogens, or predators. Phytochemicals are generally regarded as research compounds rather than essential nutrients because proof of their possible health effects has not been established yet. Phytochemicals under research can be classified into major categories, such as carotenoids and polyphenols, which include phenolic acids, flavonoids, stilbenes or lignans. The extraction was prepared with various solvents like Chloroform, Acetone, Ethanol and it includes the aqueous. Phytochemicals such as Alkaloids, Phenol, Saponins, Flavonoids, Tannins, Terpenoids, Quinone, Steroids tests were done with fresh and dried Cardiospermum halicacabum leaves sample with different solvent (Figure 2).

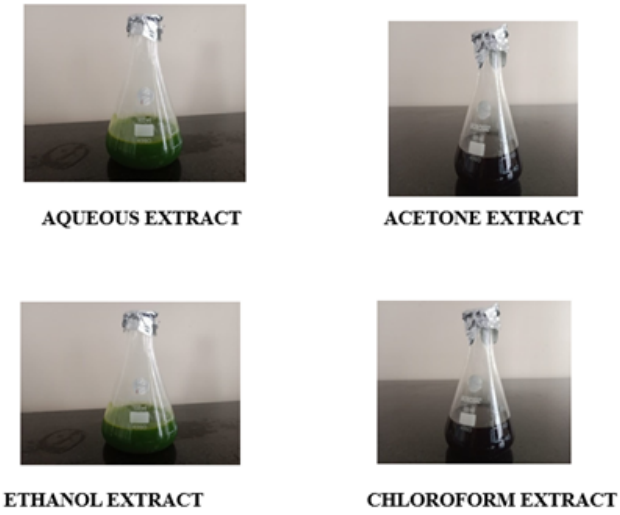

Figure 2: *Cardiospermum halicacabum* leaves sample with different solvent.

Phytochemical Analysis of Dried Leaves

Dried *Cardiospermum halicacabum* leaves powder are water-bath for 10 minutes by using different solvents. The extraction is then filtered through filter paper (Figure 3 and Table 1).

Nutrient composition of fresh leaves, dried leaves was done with standard procedure by AOAC (Association of Official Agricultural Chemists) method.

Results and Discussion

Qualitative Phytochemical Analysis of Fresh *Cardiospermum Halicacabum* Leaves with Various Solvent Extract

Phytochemicals of fresh *Cardiospermum halicacabum* leaves is present in chloroform contains alkaloids, phenols, flavonoids,

Figure 3: Qualitative phytochemical analysis in various solvent extract.

Phytochemicals	Test	Observation
Alkaloids (Wagner test)	2ml extract, 2 to 3 drops of Fecl	Greenish to black color indicates the presence of alkaloids
Flavonoids (Alkaline reagent test)	2ml extract +Few drops of NaOH solution	Intense yellow color which become colorless on addition of dil Hcl
Phenol (Ferric chloride test)	2ml extract +5%Fecl	Deep blue or green color indicates presence of phenol
Phenol (Ferric chloride test)	2ml extract +5%Fecl	Deep blue or green colour indicates presence of phenol
Saponins (Foaming test)	2ml extract +6ml dis H_2O and shake vigorously	Staple foam indicates the presence of saponins
Tannins (Braymers test)	2ml extract + Alcoholic $Fecl_3$	Blue or green colour indicates the presence of tannins
Terpenoids	1ml chloroform+2ml extract+few drops C.H_2SO_4	Reddish brown precipitate indicates presence of terpenoids
Quinone	2ml extract +con HCL	Yellow precipitate indicates the presence of quinone
Steroids	2ml extract +choloroform+H_2SO_4	Development of reddish brown colour indicates the presence of steroids

Table 1: Estimation of nutrient composition of fresh and dried *cardiospermum halicacabum* leaves.

saponins, tannins, steroids except terpenoids and quinone. Previous study shows that phytochemicals of fresh *Cardiospermum halicacabum* leaves is present in chloroform contains alkaloids, phenols, saponins, tannins and steroids except terpinoids and flavonoids (Table 2 and Figure 4).

Phytochemicals	Chloroform	Acetone	Ethanol	Aqueous
Alkaloids	+	+	+	+
Flavonoids	+	-	-	+
Phenols	+	+	+	-
Saponins	+	-	+	-
Tannins	+	+	+	+
Terpenoids	-	+	+	+
Quinone	-	-	-	+
Steroids	+	+	+	-

Table 2: Phytochemical analysis of fresh *Cardiospermum halicacabum* leaves.

Note: (+) Presence, (-) Absence

Figure 4: Analysis of phytochemicals in chloroform extract of fresh *Cardiospermum halicacabum* leaves.

Phytochemicals of fresh *Cardiospermum halicacabum* leaves present in acetone contains alkaloids, phenols, tannins, terpenoids, steroids except flavonoids, saponins and quinone. Previos study shows the presence of Phytochemicals of fresh *Cardiospermum halicacabum* leaves present in acetone contains alkaloids, phenols, tannins, terpenoids, steroids, saponins except flavonoids (Figure 5).

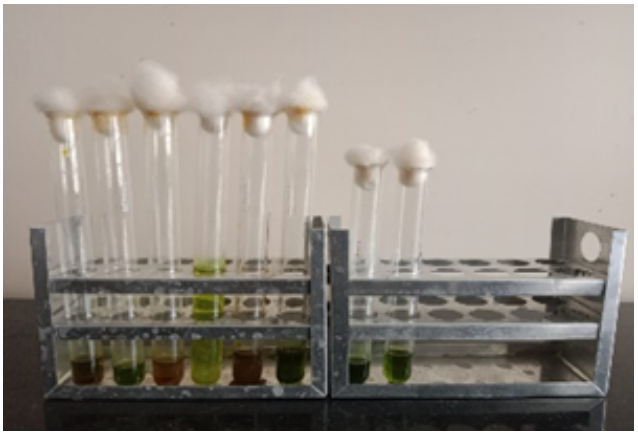

Figure 5: Analysis of phytochemicals in acetone extract of fresh *Cardiospermum halicacabum* leaves.

Phytochemicals of fresh *Cardiospermum halicacabum* leaves present in ethanol contains alkaloids, phenols, saponins, tannins, terpenoids, steroids except flavonoids and quinone. The author (Mohamed Junaid Hussain *et al.,*2020) studied about the Phytochemicals of fresh *Cardiospermum halicacabum* leaves present in ethanol contain steroids, phenols, saponins, tannins and flavonoids except terpenoids and alkaloids (Figure 6).

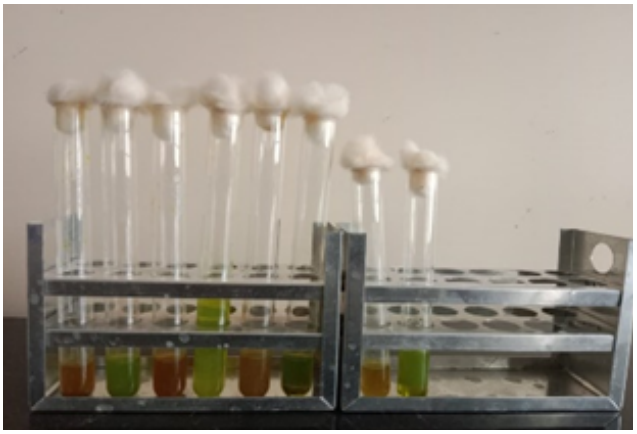

Figure 6: Analysis of phytochemicals in ethanol extract of fresh *Cardiospermum halicacabum* leaves.

Phytochemicals of fresh *Cardiospermum halicacabum* leaves present in aqueous contains alkaloids, flavonoids, tannins, terpenoids, quinone except saponins, phenols and steroids. Previous study about the presence of Phytochemicals of fresh *Cardiospermum halicacabum* leaves in aqueous contains phenols, saponins, tannins, and flavonoids except steroids, terpenoids, and alkaloids (Figure 7).

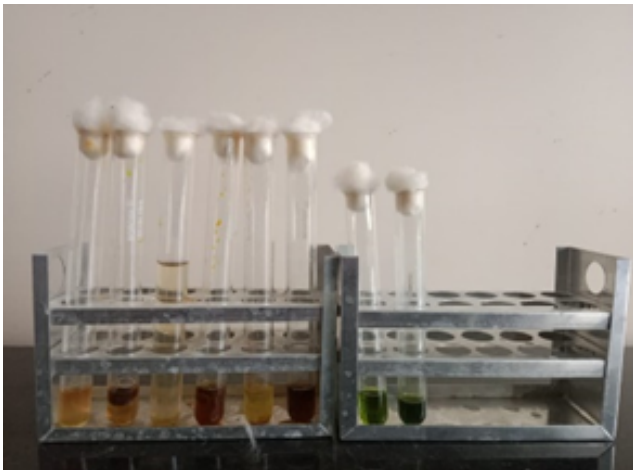

Figure 7: Analysis of phytochemicals in aqueous extract of fresh *Cardiospermum halicacabum* leaves.

Qualitative Phytochemical Analysis of Dried *Cardiospermum Halicacabum* Leaves with Various Solvent Extract

Phytochemicals of dried *Cardiospermum halicacabum* leaves is present in chloroform contains alkaloids, flavonoids, phenols, saponins, tannins, terpenoids, steroids except quinone (Table 3 and Figure 8).

Phytochemicals	Chloroform	Acetone	Ethanol	Aqueous
Alkaloids	+	+	+	-
Flavonoids	+	-	-	+
Phenols	+	-	+	-
Saponins	+	-	-	-
Tannins	+	+	-	+
Terpenoids	+	-	-	+
Quinone	-	-	+	-
Steroids	+	-	+	+

Table 3: Phytochemical analysis of dried *Cardiospermum halicacabum* leaves.

Note: (+) Presence, (-) Absence

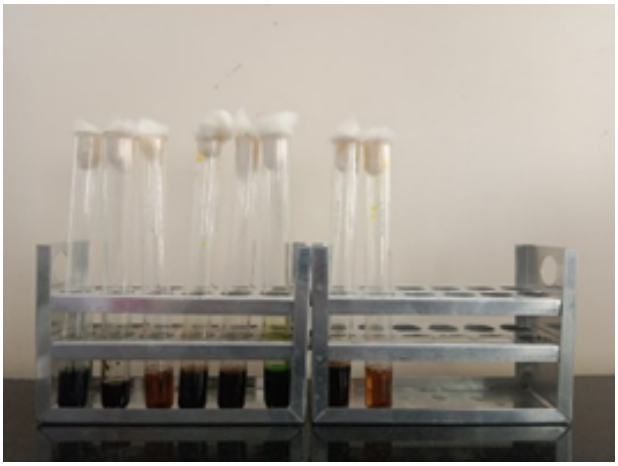

Figure 8: Analysis of phytochemicals in chloroform extract of dried *Cardiospermum halicacabum* leaves.

Phytochemicals of dried *Cardiospermum halicacabum* leaves present in acetone contains alkaloids and tannins except flavonoids, phenols, saponins, terpenoids, steroids and quinone (Figure 9).

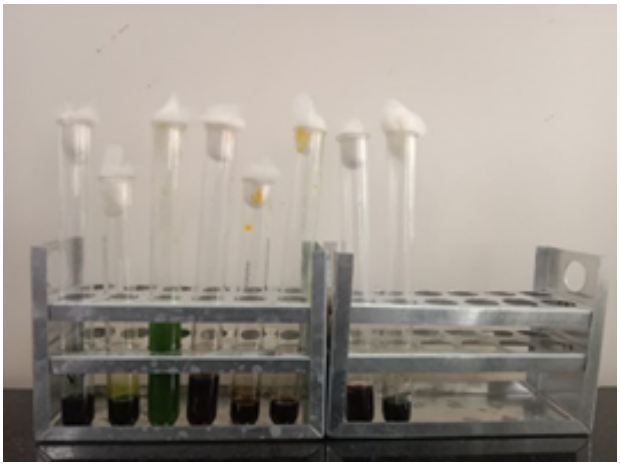

Figure 9: Analysis of phytochemicals in acetone extract of dried *Cardiospermum halicacabum* leaves.

Phytochemicals of dried *Cardiospermum halicacabum* leaves present in ethanol contains alkaloids, phenols, quinone and steroids except flavonoids, saponins, terpenoids and steroids (Figure 10).

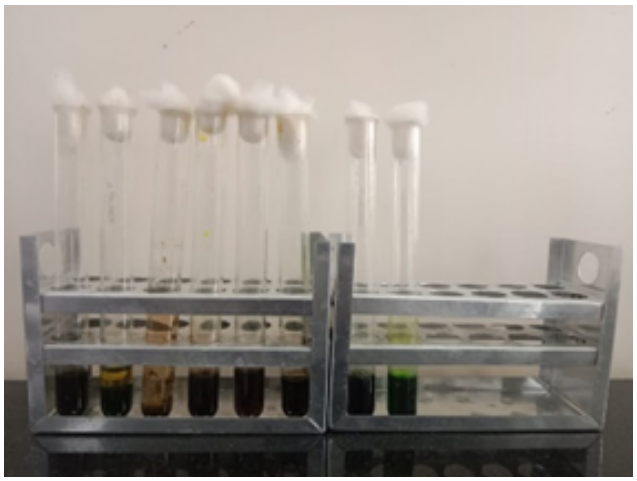

Figure 10: Analysis of phytochemicals in ethanol extract of dried *Cardiospermum halicacabum* leaves.

Phytochemicals of dried *Cardiospermum halicacabum* leaves present in aqueous contains flavonoids, tannins, terpenoids and steroids except alkaloids, phenols, saponins and quinone (Figure 11).

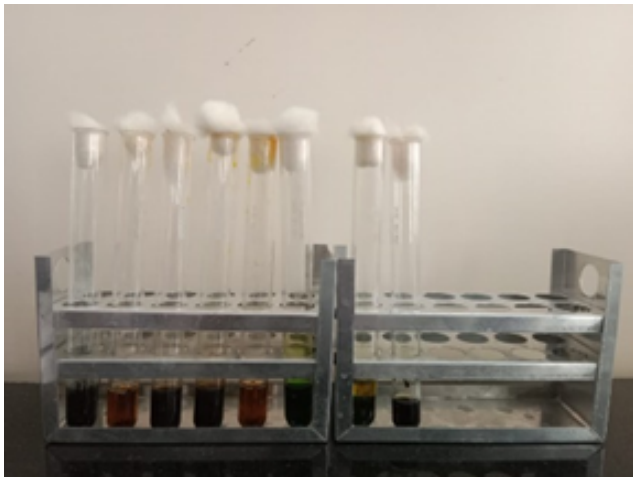

Figure 11: Analysis of phytochemicals in aqueous extract of dried *Cardiospermum halicacabum* leaves.

Nutrient Composition of Fresh *Cardiospermum Halicacabum* Leaves

Nutrients such as energy, carbohydrate, protein, fat, fibre, calcium and iron are estimated by AOAC method (Table 4).

Nutrients	Values
Energy	455.6kcal
Carbohydrates	96.5g
Protein	5.67g
Fat	0.58g
Fiber	6.83g
Calcium	608.4mg
Iron	12.3mg

Table 4: Nutrient composition of fresh *Cardiospermum halicacabum* leaves.

The above table 4, showed the nutrients present in the fresh *Cardiospermum halicacabum* leaves. It contains of 455.6 kcal energy, 96.5g of carbohydrate, 5.67g of protein, 0.58g of fat, 6.83g of fiber, 608.4mg of calcium, 12.3 mg of iron in 100grams of sample. It is rich in calcium and iron compared to other green leafy vegetables. It has high fiber content which helps to eliminate fat from the control cholesterol. Because oflow amount of fat present in the fresh *Cardiospermum halicacabum* leaves, it can be consumed by all category people.

Nutrient Composition of Dried *Cardiospermum Halicacabum* Leaves

The above table 5, showed the nutrients present in the dried *Cardiospermum halicacabum* leaves. It contains of 365.6kcal energy, 84.4g of carbohydrate, 4.7g of protein, 0.43g of fat, 5.81g of fiber, 574.3mg of calcium, 11.6mg of iron in 100grams of sample.

Nutrients	Values
Energy	365.6 Kcal
Carbohydrates	84.4 g
Protein	4.7 g
Fat	0.43 g
Fiber	5.81g
Calcium	574.3 mg
Iron	11.6 mg

Table 5: Nutrient composition of dried *Cardiospermum halicacabum* leaves.

Conclusion

The phytochemicals present in *Cardiospermum halicacabum* leaves were analysed using different solvents of ethanol, acetone, aqueous, chloroform with standard procedure. Alkaloids, tannins, terpenoids were predominantly found in all four extracts of fresh *Cardiospermum halicacabum* leaves. Alkaloids, phenols, terpenoids were predominantly found in all four extracts of dried *Cardiospermum halicacabum* leaves. Calcium and iron were rich in fresh and dried *Cardiospermum halicacabum* leaves.

Acknowledgement

We sincerely acknowledge the department of biotechnology, govt. of India, New Delhi for their financial support on our study.

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