



Phytochemical studies on the leaves of *Cardiospermum halicacabum* L.

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Abstract

Cardiospermum halicacabum L. (Sapindaceae) commonly known as 'Balloon vine' is a dioecious, hairy, climbing vine with balloon like clusters of white flowers framed by finely dissected, delicate foliage. The leaf has a bitter taste; the entire plant is used as anti-inflammatory, antibiotic against many bacteria, antiparasitic, antipyretic and as an analgesic. The ethanolic extract of leaves exhibits significant anti-arthritic effect. The present study was therefore carried out to provide phytochemical details about the leaf. Phytochemical investigation of the leaf and leaf powder of *Cardiospermum halicacabum* L. was carried out to determine phytochemical diagnostic features. The preliminary phytochemical analysis and Thin Layer Chromatography has been performed. Preliminary phytochemical analysis indicated presence of tannins, saponins, flavonoids, glycosides and cardiac glycosides. The results of the study could be useful in setting some diagnostic indices of the plant.

Keywords: phytochemical analysis, leaves, *Cardiospermum halicacabum* L

1. Introduction

Traditional knowledge of plants is responsible for most of the medicine and food used in modern society. The exploration of traditional knowledge for cures to common diseases is attractive, but also overwhelming. *Cardiospermum halicacabum* L., commonly known as Balloon vine, is an important medicinal herb belonging to family Sapindaceae. The plant is a dioecious, hairy, climbing vine with clusters of white flowers, finely dissected, delicate foliage and balloon like fruits. The root of the plant is considered as diaphoretic, diuretic and aperient. It is also administered in fever. The whole plant is applied to reduce swellings and hardened tumors (Kirtikar and Basu, 1984) ^[1]. There is a claim that it is used by some locals to treat rheumatoid arthritis in Asian and African communities. This claim is substantiated by the researchers (Kumaran and Karunakaran, 2006) ^[2-3].

The whole plant has been used as anti-inflammatory, as an antibiotic against many bacteria such as *Escherichia coli*, *Salmonella typhi* etc., as an antipyretic, antiparasitic, as an effective non toxic antifertility herb and as analgesic (Dhar, *et al.* 1968; Sadique *et al.* 1987; Raman, *et al.* 1998; Gurib, *et al.* 1992; Boonmars, *et al.* 2005; Padmini, *et al.* 2008) ^[4-9]. Eswar Kumar *et al.* (2008) ^[10] reported that the ethanolic extract of leaves exhibits significant anti-arthritic effect.

In the global market, balloon vine has been utilized in several products, 'Love in a puff', 'Balloon Vine' and 'Heartseed'. It is also one of the ingredients in "Allergy Relief Liquid™" and "Bioforce Pollinonson Tabs" marketed by Bioforce USA as a natural relief for hay fever, allergies, sneezing, watery eyes, and allergic reactions. Another US based company, Boericke and Tafel produces "Florason Cardiospermum Cream" for skin ailments such as swelling, scaling, blisters/vesicles, burning and pain. These products are supported by the various claims concerning the many medicinal properties of balloon vine (Subramanyam, *et al.* 2007) ^[11].

Therefore the present investigation of *Cardiospermum halicacabum* L. leaves is taken up to establish pharmacognostic profile of the leaves which will help in crude drug identification as well as in standardization of the quality and purity.

2. Materials and methods

Fresh leaves of *Cardiospermum halicacabum* were collected from Jayanti Kunj, Rewa (M.P.) India, washed under running tap water and blotted dry for further studies. Herbarium of *Cardiospermum halicacabum* was prepared. The leaves were dried in preset oven at $40 \pm 2^\circ\text{C}$ for about two weeks, ground into powder and used for further analysis. Physicochemical constants such as total ash, acid insoluble ash, water soluble ash; water soluble and alcohol soluble extractive values were calculated according to the methods described by Mukherjee (2005) ^[12]. Preliminary phytochemical analysis of powdered leaf was performed as described by Khandelwal (1998) ^[13] and Kokate (2007) ^[14]. Phytochemical analysis was carried out using Thin Layer Chromatography as described by Wagner and Bladt (1996) ^[15]. Fluorescence analysis was conducted using methods of Kokoski (1958) ^[16] and Chase and Pratt (1949) ^[17].

3. Results

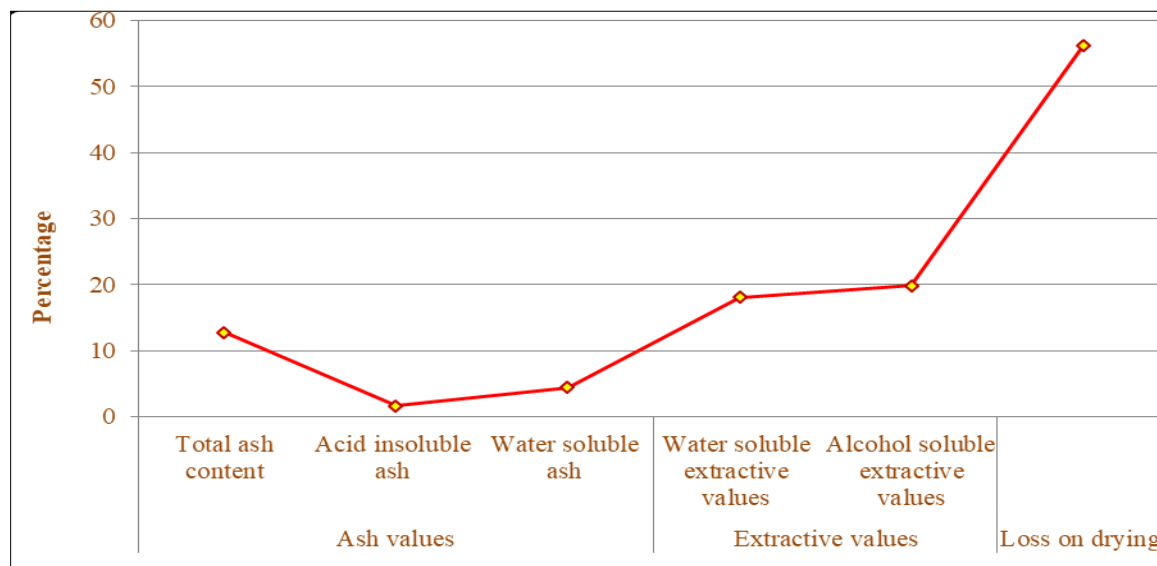
Leaf powder is green in color with characteristic odor and smooth texture.

Physico-chemical Parameters

The data on ash values are indicative of the purity of drug, extractive values are representative of the presence of polar or non-polar compounds and loss on drying value also indicates that where the drug is safe regarding any growth of bacteria, fungi and yeast (Madhurima, *et al.* 2009) ^[18]. Loss on drying, percentage of total ash, acid insoluble ash, water soluble ash and different extractive values are tabulated in Table-1.

Table 1: Physico-chemical studies of *Cardiospermum halicacabum* L. leaves

S. No.	Parameters	Observation
1.	Ash values	
	a. Total ash content (%)	12.8
	b. Acid insoluble ash (%)	1.6
2.	Extractive values	
	a. Water soluble extractive values (%)	18.06
	b. Alcohol soluble extractive values (%)	19.85
3.	Loss on drying (%)	56.20

**Fig 1:** Graphics analysis of Physico-chemical studies of *Cardiospermum halicacabum* L. leaves

Phytochemical Evaluation

Preliminary phytochemical screening is tabulated in Table-2.

Table 2: Preliminary phytochemical screening of *Cardiospermum halicacabum* L. leaves

S.No.	Test for Phytoconstituents	WE	AE	CE
1.	Carbohydrate	+	+	+
2.	Proteins	+	-	-
3.	Amino acid	+	-	-
4.	Saponins	+	-	-
5.	Tannins	+	+	+
6.	Hydrolysable Tannins	-	-	+
7.	Flavanoid	+	-	-
8.	Steroid	-	+	+
9.	Glycosides	+	-	-
10.	Cardiac glycosides	+	+	+
11.	Antraquinone	-	-	-
12.	Volatile oil	-	-	-

WE: Water Extract, AE: Alcohol Extract, CE: Chloroform Extract, +: Present, -: Absent

Results for TLC are tabulated in Table-3.

Table 3: Chromatographic result of *Cardiospermum halicacabum* L. leaf extract:

S.No.	Compound	Extract	Number of spots	Rf value
1.	Arbutin	Methanolic	4	0.05, 0.13, 0.44, 0.50
		Aqueous	2	0.05, 0.11
2.	Cardiac glycoside	Methanolic	5	0.11, 0.26, 0.62, 0.75, 0.91
		Aqueous	1	0.15
3.	Essential oil	Methanolic	9	0.15, 0.26, 0.29, 0.39, 0.42, 0.53, 0.57, 0.89, 0.94
		Aqueous	-	-
4.	Bitter principle	Methanolic	5	0.16, 0.30, 0.42, 0.68, 0.77
		Aqueous	2	0.21, 0.47
5.	Pungent principle	Methanolic	5	0.52, 0.63, 0.76, 0.84, 0.90
		Aqueous	-	-

6.	Anthracene	Methanolic	4	0.25, 0.53, 0.58, 0.93
		Aqueous	1	0.28
7.	Saponin	Methanolic	3	0.29, 0.48, 0.85
		Aqueous	1	0.57

Color reaction of powdered drug with different reagents and their fluorescence analysis were studied and recorded in Table-4.

Table 4: Fluorescence analysis of *Cardiospermum halicacabum* L. leaves

S. No.	Treatment	Observation under		
		Ordinary light	UV Light	
			254 nm	366 nm
1.	Powder as such	Green	Green	Green
2.	Powder + Nitrocellulose	Green	Green	Green
3.	Powder + 1N NaOH in methanol	Green	Green	Green
4.	Powder + 1N NaOH in methanol + Nitrocellulose in amyl acetate	Green	Dark brown	Brown
5.	Powder + 1N HCl	Brownish green	Black	Dark brown
6.	Powder + 1N HCl + Nitrocellulose in amyl acetate	Green	Black	Reddish brown
7.	Powder + 1N NaOH in water	Green	Black	Brownish green
8.	Powder + 1N NaOH in water, dried and mounted in Nitrocellulose in amyl acetate	Dark green	Black	Brownish green
9.	Powder + HNO ₃ (1:1)	Brownish green	Brown	Brown
10.	Powder + H ₂ SO ₄ (1:1)	Dark green	Dark brown	Brownish green

4. Discussion

The quantitative determination of some pharmacognostic parameters is useful for setting standards for crude drugs. The physical constant evaluation of the drugs is an important parameter in detecting adulteration or improper handling of drugs. The total ash is particularly important in the evaluation of purity of drugs i.e. presence or absence of foreign inorganic matter such as metallic salts and / or silica (Musa, *et al.* 2006) [19].

The total moisture content was found to be 56.20%, along with total ash 12.8%, of which, 1.6% is acid insoluble ash, and 4.4% is water soluble ash.

The extractive values were found to be 18.06% and 19.85% for water and alcohol respectively.

Thin Layer Chromatography revealed that methanol gives better extraction of the phytochemicals than water since the methanolic extract resolved into maximum number of bands as compare to aqueous extract. The pharmacognostical study is one of the major criteria for identification of plant. The present study on the pharmacognostical characteristics of *Cardiospermum halicacabum* L. leaves will provide useful information for its correct identity and may enable those who handle this plant to maintain its quality control.

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