

Review on Therapeutics Application of Cardiospermum Halicacabum Linn

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Abstract: Medicinal plants are natural sources of bioactive phytochemical constituents that can be utilized to treat a variety of ailments due to the marked physiological effects they have on the human body. India, with its diverse ethnic groups and unique biodiversity, has a centuries-old ethnobotanical history for health promotion and treatment of illness. Among the medicinal herbs, the plant *Cardiospermum halicacabum* belonging to the family Sapindaceae is a climber with inflated fruits and seeds with a white heart-shaped pattern. Alcohols, phenols, alkynes, flavonoids, alkanes, and aliphatic esters are the major phytochemical components present in this plant. The phytochemical examination revealed that the herb contains terpenoids, flavonoids, tannins, proteins, saponin, glycosides, carbohydrates, volatile esters, and fatty acids. *Cardiospermum halicacabum* has been demonstrated to exhibit anti-oxidant, anti-viral, anti-ulcer, anti-diabetic, anti-convulsant, antipyretic, anxiolytic, anti-cancer, anti-bacterial, anti-arthritic, anti-fungal, anti-parasitic and fertility activities. The decoction of this plant is used in the treatment of dysentery, diarrhea, cold, asthma and pertussis. Various traditional uses of the plant include its usage as a refrigerant, emetic, stomachic, diuretic, laxative, wound healing and in treating earache. This review summarizes the wide range of phytochemical constituents, pharmacological activities along with microscopical, macroscopical characteristics and traditional uses of *Cardiospermum halicacabum*.

Keywords: *Cardiospermum halicacabum*, Phytochemistry, Steroids, Terpenoids, Saponins

I. INTRODUCTION

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. [1-2] Eco-friendly and bio-friendly plant based commodities has recently been given consideration for the prevention and treatment of various human infections including microbial diseases throughout the world[3] and employment of plants in ethno medicine is on rise worldwide. [4] Nature has bestowed on us a very rich botanical wealth and a large number of diverse types of plants grow in different parts of the country. India is rich in all the three levels of biodiversity, namely species diversity, genetic diversity and habitat diversity. Herbal medicine is still the mainstay of about 75-80% of the whole population, mainly in developing countries. These plants possess various phytochemicals and active biomolecules, which play a major role in the treatment of life threatening diseases. Many plants have been examined to identify new and effective compounds, as well as to elucidate the mechanism of many diseases prevention. [5] In India thousands of species are known to have medicinal value and the use of different parts of several medicinal plants to cure specific ailments has been in vogue since ancient times and *Cardiospermum halicacabum* Linn. belonging to family Sapindaceae is one such plant widely used by traditional practitioners to cure various ailments. *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. *Halicacabum* is derived from the Latin word *halicacabus*, a plant with inflated fruits. It is a small delicate, smooth, climber and the whole plant has been used for several centuries in the treatment of many disease condition.





Fig.no1 Whole Plant Of *C. Halicacabum*

Fig.no.2 Seeds Of *C. Halicacabum*

Common name and biological source:

Botanical name: *Cardiospermum halicacabum* Linn. Synonyms: *C. corundum* L., *C. glabrum*, *C. inflatum*

Family: Sapindaceae

Common names: Heart pea, Puff-ball, Balloon vine, Heart seed Vine, Love in a puff,

Part used: Fruits, Leaves and seeds.

Growth Habit: Vine, Forb/herb.

Geography :

The plant *Cardiospermum halicacabum* Linn, is a climbing plant often found as a weed along roads and rivers. It is an annual or sometimes perennial climber, widely distributed in tropical and subtropical Africa and Asia. Young leaves of the plant can be cooked as vegetables. [6]

The herb is pubertal or almost glabrous, yearly or perpetually having slim twigs that climb by tendrillar hooks. Leaves are ternate bicomponent and leaflets acuminate at the top. The stem is 5-grooved, slim, and hairless to sparingly hairy. The leaf stalk is long, ridged, slim and with tiny stipules at the base. Its leaflets are mostly 3-part and pinnately lobed, having 5-grooved, slim, and hairless to sparingly hairy. The leaf stalk is long, ridged, slim with tiny stipules at the base. Its leaflets are mostly 3-part and pinnately lobed, having narrowed stalks. [7]

Morphological Characteristics Of *Cardiospermum Halicacabum*:

Height and structure: Grows 1 to 3 meters in length and can bloom at a height of around 25 cm. The climbing herb *Cardiospermum halicacabum* has small white flowers, compound leaves, slender, grooved stems, and inflated, papery, three-lobed capsules that contain black seeds with a white heart-shaped spot on them.

Leaves: Lobed or coarsely toothed margins, ovate to lanceolate, 1–5 cm long. The apex is acuminate, and the upper surface is bright green with a paler underside.





Fig. no.3: Cardiospermum Halicacabum Leaves

Flower: Flowers are white in colour and are small. Flowers are unisexual, obliquely zygomorphic, having straight pedicel. Fruits are membranous, depressed; pyriform casing branched at the angles[8].

Flowering season of this plant goes from July to August and seed ripening season is from August to October. Petiole contains set of 3 leaflets. Wings are sparsely hairy which contain curved hairs.



Fig.no 4: Cardiospermum Halicacabum Flower

Fruits: The fruits of Cardiospermum halicacabum are distinctive, inflated, papery capsules that resemble small balloons, typically trilobular and three-angled, measuring about 1–2.5 cm in diameter. They are light green when young and turn brown and brittle upon maturity. Each fruit capsule contains three separate chambers, and each chamber encloses a single seed.

Seeds: The seeds are small, spherical, smooth, and black, about 3–4 mm in diameter. A characteristic feature of the seeds is the presence of a prominent white heart-shaped mark (hilum) on their surface, which makes the plant easily identifiable. These lightweight, papery fruits aid in dispersal, while the firm, rounded seeds support successful germination under favorable conditions

Chemical Constituents: sapigenin, apigenin-7-O-glucuronide, β -arachidic acid, This plant yields two crystalline compounds, beta-sitosterol and beta-D-glycoside [9] as well as the essential chemical components, chrysoeriol-7-O-glucuronide and 80 luteolin-7- Oglucuronide [10]. The plant also contains rutin, which is a Quercetin and other flavonols are present in flavonol glycoside.rutinoside disaccharide. In order to control oxidative stress generated by oxygen and sunlight, herb has a number of tinyoxidative components and molecular mass, so it has been used in phytotherapy with success [11].



Saponin, L-amino acid, β sitosterol, quebrachitol, capric acid, arachidic fatty acid, and DL- DOPA are more significant constituents of this herb. For instance, acetic acid, 1,6,10- dodecatriene, 7,11, dimethyl-3-methylene-(E)-, phenol, 2,6-bis (1,1-dimethylethyl)-4- methylmethylcarbamate, 3-O-methyl-dglucose,1,14 tetradecanediol,3,7,11,15 tetramethyl-2hexadecen-1-ol, phytol, pseudoephedrine, 2-propenamide[2(dimethylamino)ethyl], E-2- The ethanol was found to contain octadecadecen-1-ol and other substances.[12] herb extract.

Embryogenic corn of the herb possess additional wholecarbohydrate, starch contents, sum of free amino acids, nucleic acids, phenols and ascorbic acid while its non-embryogenic corn showed elevated chlorophyll content, entire soluble sugar, protein, ammonia and enzymes like peroxidase and polyphenol oxidase . Seed oil of the herb possessed 49% of a diester containingtwo fatty acid moieties esterified with 1-cyano-2-hydroxymethylprop-2- ene-1-ol and 6% of one more diester derived from 1-cyano-2-hydroxymethylprop-1-ene-3- ol. Second diester treatment with methanolic hydrogen chloride generates methyl 4,4- dimethoxy-3-(methoxymethyl) butyrate from the dihydroxynitrile moiety [13].

Therapeutics application of cardiospermum halicacabum :

1) Antibacterial activity:-Microbial infections are an important health problem throughout the world and plants are possible sources of antimicrobial agents. [14] The interest to evaluate plants possessing antibacterial activity for various diseases is growing.

[15] In general, Plantbased antibacterial have enormous therapeutic potential as they can serve the purpose with lesser side effects that are often associated with synthetic antibacterial. [16] Suresh et al., 2012 was performed the In-vitro antibacterial activity of Cardiospermum halicacabum L., by agar disc diffusion method. Among this Staphylococcus aureus and Bacillus subtilis showed the high zoneof inhibition activity and also showed lesser activity against the control (Ampicilin). It is concluded that the methanolic stem extract of Cardiospermum halicacabum.

2) In vitro antidiabetics activity : The study was undertaken to investigate the glucose uptake of (antidiabetic activity) crude nhexane, ethanol, methanol and aqueous leaf extracts of Cardiospermum halicacabum. The Cardiospermum halicacabum leaf extracts were subjected to inhibitory effect of glucose utilization using specific standard in vitro procedure. The results in four different leaf extracts revealed that, the methanol extract at a concentration of 50g plant extract/L was found to be more potent than other extracts with the lowest mean glucose concentration at the end of 27hrs. The findings suggest that, the methanolic extract showed a significant inhibitory effect on glucose diffusion in vitro thus validating the traditional claim of the plant.[17]

3) Antimalarial Activity: The Ethyl acetate extracts showed limited in vitro antimalarial activity, not sufficient to warrant further investigation. The extracts showed similar activity against chloroquine-sensitive D10 and the chloroquine- and sulphonamide resistant K1 parasites. [28] 4.antiulcer activity: Ethanol extract of Cardiospermum halicacabum Linn. (Sapindaceae), in a concentration dependant manner (200–600 mg/kg) inhibited gastric ulcers induced by oral administration of absolute Ethanol. Further, the extract administration to rats resulted in an increase in levels of gastric glutathione and a

decrease in alkaline phosphatase activity. The extract also exhibited potent in vitro hydroxyl radical scavenging and inhibition of lipid peroxidation activities. The extract was found to be devoid of any conspicuous acute and short-term toxicity in rats.[18] 4)Fertility activity:The treatment with aqueous leaf extract (ALE) of Cardiospermum halicacabum

for 30 days produced a significant dose dependent increase in the sperm counts and sperm motility in both caput and cauda regions. Further, significant increase in serum testosterone level was evident at all applied doses.However, no significant changes in the weight of sex organs were observed. Aqueous leaf extract also increased the number of females impregnated, number of implantations,and number of viable fetuses while decreasing the total. number of resorption sites in the pregnant females. However,the total cholesterol level in the serum remained unchanged and there were no recordsn on renotoxicity; nevertheless ALE exhibited a hepatoprotective effect. It was concluded that aqueous leaf extract of Cardiospermum halicacabum enhanced sperm concentration, motility, and testosterone, leading to positive results in fertility.[19].

5) Antioxidant Activity: Fresh and dried materials of C.halicacabum was evaluated for their total phenolic Content (TPC) and antioxidant activity using DPPH (1, 1- diphenyl2picrylhydrazyl), TPC (Total phenol content) and FRAP (Ferric Reducing Antioxidant Power) methods showed a significant reduction in antioxidant property for microwave



treated plant material when compared to other drying treatments. PPH radical scavenging effect was observed in methanol extraction of microwave treated sample. The highly significant total phenol content was recorded with freshly used plant material extracted with distilled boiled water. Proportionate to the phenolic content, extract from boiling water showed significant ferric reducing activity, due to greater solubility of compounds, breakdown of cellular constituents as well as hydrolysis of tannins. A strong free radical scavenging activity in the plant material suggests that it has great potential Antioxidant activity. [20].

6) Anxiolytic Activity: Antianxiety effects of alcoholic and aqueous root extracts of *Cardiospermum halicacabum* in mice are studied. Mice were treated with the alcoholic or aqueous extract 1 hr before subjecting the animals to various anxiety models. Anti anxiety activity was evaluated using elevated plus maze (EPM), light-dark model (LDM) and open field test (OFT). In EPM, treatment with alcoholic and aqueous extracts increased the time spent in open arm and total locomotion time. In light dark model treatment with these extracts showed increase in time spent in light compartment and in Open field test treatment with these extracts increased the time spent in central compartment. These results

suggest that alcoholic and aqueous extracts of *Cardiospermum halicacabum* possess antianxiety activity.[21]

7) Anticonvulsant Activity: of Alcoholic Root Extract of *Cardiospermum Halicacabum*: Epilepsy is a common neurological disorder affecting an estimated 40-50 million people worldwide. [22] To evaluate the anticonvulsant effects of alcoholic root extract of *Cardiospermum halicacabum* L., Sapindaceae (ARECH), on the various marine models of epilepsy, the root extract of the plant was administered p.o. to male swiss albino mice at doses of 30, 100 and 300 mg/kg before evaluation. The brain monoamine levels were determined after two days administration. ARECH at doses of 100 and 300 mg/kg significantly delayed the onset of clonus and tonus in Pentylene tetrazol, Isoniazid and Picrotoxin-induced convulsions. Tonic hind limb extension was also decreased at doses of 100 and 300 mg/kg as compared to vehicle control in maximal electroshock model. No significant motor toxicity was observed even at a highest dose administered, i.e. 900 mg/kg. Brain monoamine analysis by HPLC revealed a significant increase in GABAergic activity in C+ (in cerebellum) and C- (except cerebellum). These results suggested that ARECH possesses a significant anticonvulsant activity with a low motor toxicity profile. This activity may be attributed to an increase in GABAergic activity.[23]

8) Anti-Arthritic Activity: Inflammatory diseases including different types of rheumatic diseases are a major cause of morbidity of the working force throughout world. This has been called the „King of Human Miseries. [24] The anti-arthritic effect of oral administration of ethanolic extract of *Cardiospermum halicacabum* leaves (CEE) at the dose of 125 mg/kg and 250 mg/kg on Freund's complete adjuvant (FCA) induced arthritis has been studied in rats. The treatment is assessed by measuring the paw volume and by using various hematological parameters like hemoglobin (Hb) content, total red blood cell (RBC) count, white blood cell (WBC) count and erythrocyte sedimentation rate (ESR). The investigated result showed that the extract inhibited the FCA induced arthritis in a dose dependent manner and this effect was more significant with 250 mg/kg dose. Administration of extract improved the body weight significantly when compared to FCA induced arthritis rats. The results were compared to that of Indomethacin. The results suggest that the ethanolic extract of *Cardiospermum halicacabum* leaves exhibits significant anti-arthritic effect. [25]

II. CONCLUSION

Cardiospermum halicacabum L. is a true miracle of nature because of its many advantages. *Cardiospermum halicacabum* L. has been the subject of numerous studies on various parts, but the pharmaceutical industry has not yet developed this plant as a drug. Identification, cataloging, and documentation of plants require a thorough and methodical investigation, which could offer a significant means of advancing traditional knowledge of herbal medicinal plants. Given the characteristics of the plant, additional human research can be conducted to produce a medication with a variety of effects that will be on the market in the future.



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