

PHARMACOLOGICAL PROPERTIES OF *CARDIOSPERMUM HALICACABUM*-A REVIEW

Krishna Murti¹, Mayank A. Panchal^{2*} Vijay Lambole² and Vipul Gajera²

¹Asst. professor, Department of Pharmacology, Vidyabharti Trust College of Pharmacy, UmraKh, Gujarat, India.

^{2*} P.G. Student, Department of Pharmacognosy, Vidyabharti Trust College of Pharmacy, UmraKh, Gujarat, India.

²Department of Pharmacology, Vidyabharti Trust College of Pharmacy, UmraKh, Gujarat, India.

* For Correspondence

Mayank A. Panchal

mynk_1511@ymail.com

Mob: +919998666877

Summary

The present review describes the morphological, phytochemical and pharmacology aspects of *Cardiospermum halicacabum* (Sapindaceae). Balloon-vine was originally indigenous to the Bermudas, Florida and Texas. Nowadays it grows extensively in India, Africa and South America, where, in some places. Balloon Vine is a woody perennial vine distributed almost globally in the tropics. It is a fast growing vine up to 10 feet. This plant, commonly known as “kanphuti”, is used in Ayurveda and folk medicine for the treatment of rheumatism, lumbago, earache and fever. It is regarded as a rampaging weed and is a deciduous, branching, herbaceous climber. The whole plant has been used for several centuries in the treatment of rheumatism, stiffness of limbs, snake bite. So, an overview of phytochemical and pharmacological properties is given in the present paper.

Keywords: *Cardiospermum halicacabum*; Pharmacognosy; Phytochemistry; Pharmacological profile.

Introduction

Cardiospermum halicacabum is a member of the family Sapindaceae. It is widely distributed in the tropics and subtropics. It is a climber found in tropical forests of East Africa. It is used for cough, hyperthermia, rheumatism, lumbago, nervous illnesses and amenorrhoea¹. This plant is used in Ayurveda and folk medicine for the treatment of rheumatism, lumbago, earache and fever².

Cardiospermum halicacabum L., commonly known as ‘Kanphuti’, from family Sapindaceae is an annual or perennial climber, widely distributed in tropical and subtropical Asia and Africa, and often found through out India. *Cardiospermum halicacabum* L. has been used in Ayurveda and folk medicine for a long time in the treatment of rheumatism, lumbago, nervous diseases, as a demulcent in orchitis and in dropsy. The herb is diuretic, stomachic and rubefacient³.

C. halicacabum is commonly used in human homeopathy. In traditional medicine in Asia and Africa, *C. halicacabum* is used orally or dermally.



Fig: *Cardiospermum halicacabum* L.

Botanical name: *Cardiospermum halicacabum* L.

Synonyms: *C. corumdum* L., *C. glabrum*, *C. inflatum*

Family: Sapindaceae

Common names: Heart pea, Puff-ball, Balloonvine, Heartseed Vine, Love in a puff,

Part used: Fruits, Leaves and seeds

Growth Habit: Vine , Forb/herb

Cardiospermum halicacabum, or Balloon Vine, is a woody, perennial vine native to Tropical America. They are fast growing to 10 feet (3 m) with twice 3-parted leaves that will reach 4 inches (10 cm) long. The plants climb with tendrils and need some form of support. They are used as annuals in USDA zones 5-8 and are perennial in zones 9-11.

MORPHOLOGY

Leaves are alternate and have axillary tendrils. Fruits are the inflated, membranous fruits give this species its common name Balloonvine. The sepals remain attached in the fruit. The seeds inside the capsule have a white heart shape spot which is described in the generic name *Cardiospermum* (Cardio - heart, sperma - seed).

Balloon-vine is a perennial creeper at its base, the plant's stem is only approximately 3 mm thick, but it can reach a height of up to 2 metres. The stem forms internodes of between 5-10 cm in length.

The grooved stem carries alternate double triad leaves, 3 to 5 cm long, which are hairless or covered in a soft down of hairs. The oval or lanceate leaves have a deeply serrated or lobated edge. The leaflets at the side are smaller. The tiny radiate flowers are white, standing in rolls on long flower stems of 5 to 10 cm in length. The perianth consists of 4 to 5 egg-shaped sepals and four petals with banner or wing-like fine combs. There are 8 anthers. Just beneath the flower stalks are 2 cm long tendrils, usually in pairs. The roughly 3 cm long green fruit is a blown up, almost entirely spherical capsule containing the characteristic seeds with their heart-shaped white markings. The plant blooms in different periods, depending on where it grows. The Sapindaceae family is almost only to be found in tropical regions. The fruits of the species *Sapindus* contain saponins and foam in water, which is why they are used for washing in their native land. The flesh of the fruit is usually edible.

PHYTOCHEMISTRY

The whole plant contains Alkaloid, flavanoids, proanthocyanidin, apigenins and phytosterol (eg. Stigmasterol) etc. Tannins⁴ flavonoids⁵ alkaloids⁶ saponins, reducing sugars, sterols and triterpenes⁷ are reported for their antidiarrhoeal activity. The seeds contain approximately 33% of fatty acids and of these fatty acids about 55% are cyano lipids. The major cyano lipids (49%) is diester having 2 fatty acids moieties esterified with 2-cyano,2-hydroxyl methyl prop-2-ene-3-ol followed by diester derived from 2-cyano,2-hydroxyl methyl prop-2-ene-3-ol (6%). Of the fatty acids, 11-eicosinic acid is with 42% of major one (42%), other chief constituents of oil are oleic acid (22%), arachidonic acid (10%), linoleic acid (3%), stearic acid (2%). In the leaves, larger amount of alkaloids and saponins were found. Also (+) - pinitol, apigenin, luteolin and chrysoarinol. The occurrence of esterified fatty acids, pentacyclic triterpenoids and hydrocyanic acid releasing cyano lipids in the mother tincture. Alkaloids have not been detected in the homeopathic mother tincture. The mother tincture contains a relatively higher amount of flavanoids than the plants⁸⁻¹¹.

PHARMACOLOGICAL ACTIVITIES

Antidiarrhoeal activity: Antidiarrhoeal activity of whole plant extracts of *Cardiospermum halicacabum* (Linn). One-fifth of the maximum dose of LD50 of each extract was selected to study the antidiarrhoeal activity in different experimental models such as castor oil-induced diarrhoea, prostaglandin E2 (PGE2)-induced enteropooling and charcoal meal test in rats. The whole plant extracts (i.e. petroleum ether, alcohol and aqueous) of *C. halicacabum* (Linn) contain tannins, flavonoids, saponins, sterols and triterpenes, which could have contributed to the antidiarrhoeal activity. Antidiarrhoeal activity of the extracts of *Cardiospermum halicacabum*, which may be due to the presence of phytochemical constituents such as sterols, tannins, flavonoids and triterpenes¹²⁻¹⁵.

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 parasites¹⁶.

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 rats¹⁷.

Anti-inflammatory activity:

The ethanolic extract of the whole plant was used to evaluate the anti-inflammatory action in mouse macrophage cell line RAW264.7 cells. Ethanol extract dose dependently inhibit mRNA expression of COX-2, TNF- α , iNOS and COX-2 protein expression. But the extract did not affect the expression of COX-1 mRNA expression. Furthermore, *Cardiospermum halicacabum* L. ethanol extract inhibited the TNF- α induced DNA binding activity of NF-kB, which was associated with decreased p65 protein level in the nucleus in Jurkat cells¹⁸.

Conclusion

The multiple benefits of *Cardiospermum halicacabum* L. made it a true miracle of nature. Numerous studies have been conducted on different parts of *Cardiospermum halicacabum* L. but this plant has not yet developed as a drug by pharmaceutical industries. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. In view of the nature of the plant, more research work can be done on humans so that a drug with multifarious effects will be available in the future market.

References

- 1) Neuwinger, HD. African Traditional Medicine: A Dictionary of Plant Use and Applications. Medpharm GmbH Scientific Publishers, Stuttgart, Germany, 2000; 1–300.
- 2) Nadkarni, KM. *Indian Materia Medica*. Popular Book Depot, Bombay, 1976; 271.
- 3) Joshi SK, Sharma BD, Bhatia CR, Singh RV and Thakur RS. The Wealth of India Raw Materials. Council of Scientific and Industrial Research Publication, New Delhi, 1992; 456-58.

- 4) Yu LL, Liao JF, Chen CF. Anti-diarrhoeal effect of water extracts of *Evodiae fructus* in mice. *J Ethnopharmacol.* 2000; **73**:39-45.
- 5) Galvez J, Zarzuelo A, Crespo ME, Lorente MD, Ocete MA and Jimenez J. Anti-diarrhoeal activity of *Euphorbia hirta* extract and isolation of an active flavonoidal constituent. *Planta Med* 1993; **59**: 333-6.
- 6) Al-Rehaily AJ, El-Tahir KEH, Mossa JS and Rafatullah S. Pharmacological studies of various extract from hexane extract of *Ticlea nobilis* in rodents. *Nat Prod Sci.* 2001; **7**: 76-82.
- 7) Otshudi AL, Vercruysee A and Fotiers A. Contribution of the ethnobotanical, phytochemical and pharmacological studies of traditionally used medicinal plants in the treatment of dysentery and diarrhoea in Lomela area (DRC). *J Ethnopharmacol* 2000; **71**: 411-423.
- 8) Ahmed I, Ahmed M and Ahmed A. Chemical investigation of the genus *Cardiospermum* of the family sapindaceae. Lahore: *Science International.* 1993; **22**: 286.
- 9) Ferrara I, Schettino O and Montesano D. Triterpenoids from *Cardiospermum halicacabum* L. *Phytotherapy Research* 1996; **10**: 192-194.
- 10) Srinivas K, Choudhary KA, Rao SS, Satyanarayana T and Krishna Rao RV. Phytochemical investigation of *Cardiospermum halicacabum* Linn. *Indian J Natural Products.* 1998; **14**: 24-27.
- 11) Hopkins CY, Ewing DF and Chiosholm MJ. A short chain ester from the seed oil of *Cardiospermum halicacabum* Linn. *Phytochemistry* .1968; **7**: 619-624.
- 12) Rao NV, Prakash KC and Kumar SM. Pharmacological investigation of *Cardiospermum halicacabum* (Linn) in different animal models of diarrhoea. *Ind jour of Phar.* 2006; **38**(5): 346-349.
- 13) Di Carlo G, Autore G, Izzo AA, Maibline P, Mascolo N and Viola P. Inhibition of intestinal motility and secretion by flavonoids in mice and rats: structure- activity relationship. *J Pharm Pharmacol.* 1993; **45**: 1054-1059.
- 14) Rao VSN, Santos FA, Sobreika TT, Souza MF, Melo LL and Silveria ER. Investigation on the gastroprotective and anti-diarrhoeal properties of ternatin, a tetramethoxyflavone from *Egletes viscosae* . *Planta Med.* 1997; **63**: 146-149.
- 15) Rao, N Venkat; Chandra Prakash, K; Shanta Kumar, SM "Pharmacological investigation of *Cardiospermum halicacabum* (Linn) in different animal models of diarrhoea", *Indian Journal of Pharmacology.* 2006; **38**: 346-349
- 16) Neill AL and Hunt NH. Pathology of fatal and resolving *Plasmodium berghei* cerebral malaria in mice. *Parasitology.* 1992; **105**: 165–175.
- 17) Sheeba MS and Asha VV. Effect of *Cardiospermum halicacabum* on Ethanol-induced gastric ulcers in rats. *Journal of Ethnopharmacology.* 2006; **106**: 105–110.
- 18) Sheeba MS and Asha VV. *Cardiospermum halicacabum* ethanol extract inhibits LPS induced COX-2, TNF- α and iNOS expression, which is mediated by NF-kB regulation, in RAW264.7 cells. *Journal of Ethnopharmacology.* 2009; **22**: 39–44.