



CENTELLA ASIATICA L.: A CONCISE DRUG REVIEW WITH PROBABLE CLINICAL USES

MD. AMINUL ISLAM APU

Department of Biotechnology and Genetic Engineering, Faculty of Applied Science and Technology, Islamic University, Kushtia-7003, Bangladesh.
Email: apu.btge@gmail.com.

Received -24-11-15; Reviewed and accepted -06-12-15

ABSTRACT

Centella asiatica L. is widely used as a medicinal herbs and alternative medicine in treating numerous kinds of diseases since prehistoric times. It is a perennial, creeper, faintly aromatic and a valuable medicinal herb of both Old World and the New World. The use of *Centella* in food and beverages has increased over the years basically due to its beneficial functional properties. Its potential antioxidant, antimicrobial, cytotoxic, neuroprotective and other activities have been widely claimed in many reports. The requirement of *Centella asiatica* is now met from natural population, leading to their gradual depletion and thus followed by its placement in the list of threatened species as mentioned by IUCN. It is distributed throughout tropical and subtropical regions of World such as Bangladesh, India, China, Nepal, Madagascar, Sri Lanka and Indonesia etc. The present review is an up-to-date and comprehensive literature analysis of the chemistry and various health beneficial functional properties of the *Centella* plant.

Keywords: *Centella asiatica*, food beverage, antioxidant, pharmacology, neuroprotective.

INTRODUCTION

Plants have been enumerated as an eminent basis of medicine since immemorial past. Drugs based on the plants are of prime importance for several remedies in traditional and conventional medicine throughout the world and serves as a substitute for drug supply in modern medicine. In recent times, focus on plant research has increased all over the world and a large body of evidence has been accumulated to highlight the immense potential of medicinal plants used in various traditional systems of

medicine. *Centella asiatica* (CA) is a very important medicinal herb used in the orient, which is also becoming popular in the West. In the developing countries, approximately 80% of the populations still rely on the traditional medicine derived from the plants for health care needs [1-4].

Vernacular names in different regions

C. asiatica has been named by an array of vernacular names throughout the world [5-7]

Table 1: Vernacular names in different regions of the world.

Region/Language	Vernacular Name	Region/Language	Vernacular Name
Bangladesh	Thankuni, Tholkuri	Nepal	Ghod tapre
India	Bemgsag, Brahma-Manduki	Cook Islands	Kapukapu
USA	Indian Pennywort, Marsh Pennywort	Tahiti	Tohetupou
China	Fo-ti-tieng, Chi-hsueuh-ts'ao	Fiji	Totodro
Hawaii	Pohe Kula	Samoa, Tonga	Tono
Malaysia	Pegaga	Europe	Gotu Kola
Indonesia	Pegagan, kaki kuda		

Nutritive composition of *Centella asiatica*

Quantitative interpretation reveals that *C. asiatica* comprises high amount of water. Besides, it also serves as a good source of various macro and micronutrients, proteins and vitamins, such as ascorbic acid, thiamine and carotene [8]. The details of composition are listed in the table [7].

Table 2: Nutritive composition of *Centella asiatica*.

Composition	Value	Composition	Value
Moisture	84.6%	Ascorbic acid	11
Protein	2.4%	Thiamine	0.04
Fiber (per 100 g) (insoluble dietary)	5.43g	Carotene	25.93
Soluble dietary	0.49g	β Carotene	3.90
Ca (mg/100 g)	174	Mg	87
P	17	Fe	14.86
K	345	Zn	0.97
Na	107.8	Cu	0.24
		Cr	0.046

Traditional Uses

C. asiatica L. is a classic ethno medicinal species used by tribal groups and also by ancient civilizations. Some of the important traditional Socio-Economic uses of this marvelous herb *Centella asiatica* in different countries and in different ways are illustrated as

In Bangladesh, whole plant is utilized by Kavirajes (a community of Chalna area, Bangladesh) to treat multiple ailments like dog bite, asthma, carminative, itching, leucorrhoea, malaria, tumor and wounds [5, 9]

In India, *Centella asiatica* is valued as an ethno medicine as well as in Ayurveda and Unani, the traditional Indian medicinal systems for thousands of years for different ailments like asthma, skin disorders, ulcers and body aches [10-14] for improving memory, as a nervine tonic and in treatment of dropsy, elephantiasis, gastric catarrh, kidney troubles, leprosy, leucorrhoea and urethritis in maternal health care [15] in treatment of stomach disorders and also as a vegetable [16]. It is also used in the form of cover crop in rubber and tea plantations.

In Sri Lanka, the leaves of *C. asiatica* are used as "mallung" which is a traditional curry and in the porridge known as "kolakenda" to combat malnutrition [17]. Extract of the *C. asiatica* is also used in the production of food products, i.e. herbal noodles [18].

In Nepal, also this herb is used traditionally in rheumatism, indigestion, leprosy, poor memory [5]

In China, The traditional Chinese function include the use of this herb for dysentery and summer diarrhea, vomiting, jaundice and scabies, Hansen's disease (leprosy), nosebleeds, tonsillitis, fractures, measles, tuberculosis, urinary difficulties, as a

endocrine tonic and as an 'adaptogen', have diuretic properties It is used in the form of cooling drink [19-21].

Centella asiatica in Food and Beverage

Centella is commonly eaten fresh as vegetable (ulam and salad) [22]. The salads are eaten together with the main meal and can act as an appetizer. Beside eaten raw, it can be cooked as a part of a soup or as a main vegetable. Since the *Centella* is very popular as a vegetable, it is available everywhere in the wet markets and supermarkets. As a vegetable and therapeutic use, the whole plant including leaves, stem and root are consumed [23]. It is used as health tonic and processed into cordial drinks and ready to drink juice [24]. The fresh plants are also blended to make drink and juice. The fresh prepared juice is popular and available in the restaurant and sold by many sellers by the road side. It is so common used as a drink by the Thai and Chinese

people for thirst quenching purpose or cooling drink as well as reducing the "inner heat" to assist in healing and curing of aphthous ulcers.

Cosmetical applications

C. asiatica is similar to aloe vera insofar as it has a long history of wideranging medical applications [30]. *Centella asiatica* extract was shown to enhance the levels of enzymatic and non-enzymatic antioxidants such as superoxide dismutase, catalase, glutathione peroxidase, vitamin E and ascorbic acid in newly formed tissues, further validating its role in skin health maintenance

Commercial products

List of some Products launched in the market, containing *Centella asiatica* [5].

Table 3: Some Products launched in the market, containing *Centella asiatica*

Name of the Product	Company	Applications
Mentat	The Himalaya Drug Company, Bangalore [India]	Improves mental functions by a modulation of the cholinergic and GABAergic neurotransmission. It improves mental quotient, memory span, concentration ability and stress threshold, beneficial in insomnia and corrects speech defects. It exhibits Significant anti-parkinsonian activity.
Gertiforte (Geri Care/ Stress Care)	The Himalaya Drug Company, Bangalore [India]	The anti-stress, adaptogenic properties of Gertiforte retard degenerative changes and accelerate cellular regeneration. It enhances body immunity, delays aging, it assists cardiovascular functioning by improving circulation and reducing raised lipid levels also improves appetite.
Abana (Heart Care)	The Himalaya Drug Company, Bangalore [India]	Abana regulates serum lipids by lowering the cholesterol, triglycerides, low-density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels and restores the cardio protective high density lipoprotein (HDL) level. It also reduces platelet aggregation.
Menosan	The Himalaya Drug Company, Bangalore [India]	Menosan possesses phytoestrogens, which act through estrogen receptor dependent mechanism. Menosan helps in alleviating symptoms of menopausal syndrome.
Nourishing Skin Cream	The Himalaya Drug Company, Bangalore [India]	Provides all day moisturizing, nourishment and protection to skin from pollution and dry weather.
SNP Control Cream	SD Biotechnologies co.,Ltd. [Korea]	<i>Centella asiatica</i> extract and Allantoin, improves drying and delays skin aging.
Eye Treatment Serum	Eye Love Beauty, Inc [Korea]	<i>Centella asiatica</i> extract, fucoidan sea algae ingredient pacify the skin moistly provides high purity.
Diamond Shiny Pearl BB	Elishacoy, [Korea]	<i>Centella asiatica</i> and <i>Portulaca oleracea</i> extract, makes the skin viable by calming irritation.
Organic Baby Skin Care	Nutricare Co., Ltd.[Korea]	<i>Centella asiatica</i> and <i>Portulaca</i> extracts, it soothes and calms the irritated skin and restores the purified and clean skin
Mandarin O2 Foaming Cleanser	H & H Co., Ltd. [Korea]	<i>Centella asiatica</i> extract and Rosemary extract help your skin clean and healthy.
Weight Loss Tea	Pairs of Horses Biotechnology Co., Ltd. [China]	<i>C. asiatica</i> , Wolfberry fruit, Chrysanthemum, Pinellia, Salvia, for sliming.
Gotu Kola and Germanium Moisturizer	SUNDARI	Gotu kola (<i>Centella asiatica</i>) firms and lifts skin while Germanium extract balances sebum productions to produce faster results leaving a soft, dewy finish.
Mandukaparni	The Himalaya Drug Company, Bangalore [India]	Improves mental abilities, vascular support, blood circulation and psoriasis.
Gertiforte Vet (Animal Health Care)	The Himalaya Drug Company, Bangalore [India]	Antioxidant, anti-stress and immune modulatory.
Anxocare (Animal Health Care)	The Himalaya Drug Company, Bangalore [India]	Anxiolytic, Behavior modifier, Memory enhancer.

Centella asiatica as medicine

C. asiatica L. has been used for several hundred years in folk medicines. In Indian Ayurveda literature, *C. asiatica* is considered as one of the recognized drugs used for "Rasayana" purpose [25]. In Chinese medicine, *C. asiatica* is used for treatment of vomiting, epistaxis, urinary calculi, scabies and jaundice. In homeopathic medicine, it is used for treating ascariasis,

elephantiasis and in granular cervicites. Clinical tests have formulated several benefits of *C. asiatica* extracts in terms of wound healing [26][27] burns and in skin diseases in gastrointestinal disorders and in treatment of leprosy, lupus, scleroderma, eczema, veins diseases and for treatment of psoriasis.

Memory enhancing activity

Aqueous extract of *C. asiatica* showed significant effect on learning and memory enhancing and significantly decreased the levels of nor epineprine, dopamine and 5-HT and their metabolites in the brain [28]. Treatment during postnatal developmental stage with *C. asiatica* aqueous extract influenced the neuronal morphology and promoted the higher brain function of juvenile and young adult mice. *Centella asiatica* contains brahmic acid, isobrahmic acid, brahminoside and brahmoside that enhance memory activity.

Skin protective activity

Skin aging appears to be principally related to a decrease in the levels of type I collagen, the primary component of the skin dermis. Asiaticoside, a saponin component isolated from *Centella asiatica*, has been shown to induce type I collagen synthesis in human dermal fibroblast cells [29].

Wound healing effect

Total triterpenoid fraction extracted from *C. asiatica* increased the percentage of collagen in cell layer fibronectin and thus may help in promoting wound healing [33]. Increased cellular proliferation and collagen synthesis, angiogenesis and epithelialization at wound site is brought about by madecassol. Madecassol, an extract of this plant containing madecassic acid, asiatic acid and asiaticoside accelerates cicatrization and grafting of wounds. Asiaticoside, one of the active constituent of *C. asiatica* induces antioxidant activity at the initial stage thus playing important role in wound healing [32].

Anticancer

Preclinical studies have shown that methanolic extract of *C. asiatica* causes inhibition in breast cancer cells by inducing apoptosis in different cancer cell lines HeLa, HepG2 and SW48 and MCF-7. Out of which MCF-7 found to be most sensitive line for *in vitro* growth inhibitory activity which is marked by decrease in cell viability that is concentration dependent based on MTT assay [34]. Upon oral administration *C. asiatica* (500 and 1000 mg/kg) exhibits significant decrease in the level of tumor incidence, weight, cumulative number of papilloma in comparison to carcinogen control group [30].

Mental-retardation

Centella asiatica tablets administered orally to mentally retarded children showed significant increase in general ability and behavior patterns [31].

Use in pregnancy and lactation

Gotukola has been traditionally used in Bengal as a contraceptive agent. Antifertility activity was demonstrated *in vivo* in an early study of *C. asiatica*. Gotukola was tested for ant zygotic, anti-implantation and early abortifacient activity [35].

Safety in children

Dried herb has been assessed in a clinical trial in India as a mental tonic for mentally disabled children [35].

Safety

Scientists who studied the topical effects of the herb and its active constituents (asiaticoside, asiatic acid and madecassic acid) on guinea pigs, reported that all the materials studied are very weak sensitizers and that the risk of acquiring contact sensitivity to the plant or its constituents is low [35].

ACKNOWLEDGEMENT

I am cordially thankful to all teachers from the Department of Biotechnology and Genetic Engineering, Faculty of Applied Science and Technology, Islamic University, Kushtia-7003, Bangladesh. For their valuable suggestions and inspiration during my Review article proceedings.

CONCLUSION

Centella asiatica has been in use since times immemorial to treat wide range of indications. The dynamic nature of indigenous knowledge has led to its survival through centuries. The use of this knowledge is necessary as it is not only socially desirable but is economically affordable, sustainable and involves minimum risks and procedures. The herb is widely available and very cost effective. *Centella asiatica* is a very important herbal plant in food and beverages. Its potential as a natural antioxidant extract reflects its capability to become a candidate to prevent oxidative damage, hence promoting health benefits.

REFERENCES

1. Apichartsrangkoon, A., Wongfahun, P., Michael, H. and Gordon, M. H. 2009. Flavor characterization of sugaradded pennywort (*Centella asiatica* L.) juices treated with ultra-high pressure and thermal processes. *Journal of Food Science* 9: C643–C646.
2. rinkhaus, B., Lindner, M., Schuppan, D. and Hahn, E. G. 2000. Chemical, pharmacological and clinical profile of the East Asian medical plant *Centella asiatica*. *Phytomedicine* 7: 427-428.
3. Duke, J. A. 2001. *Handbook of Medicinal Herbs*. 1st edn. New York: CRC Press.
4. Hamid, A. A, Md Shah, Z., Muse, R. and Mohamed, S. 2002. Characterisation of antioxidative of *Centella asiatica* (L) Urban. *Food Chemistry* 77: 465-469.
5. Sakshi Singh, Asmita Gautam, Abhimanyu Sharma and Amla Batra, 2010, *Centella asiatica* (L.) : A plant with immense medicinal potential but threatened, *International Journal of Pharmaceutical Sciences Review and Research*; Article 003
6. Singh S., Gautam A., Sharma A., Batra A., *Centella asiatica* (L.): a plant with immense medicinal potential but threatened. *International Journal of Pharmaceutical Sciences Review and Research*, 4: 9-17, (2010).
7. Kanchan Joshi and Preeti Chaturvedi 2013, Therapeutic efficiency of *Centella asiatica* (L.) Urb. An underutilized green leafy vegetable : an overview, *International Journal of Pharma and Bio Sciences* 2013 Jan; 4(1): (P) 135 – 149
8. Gupta S., Lakshmi A. J., Manjunath M. N., Prakash J., Analysis of nutrient and antinutrient content of underutilized green leafy vegetable . *LWT-Food Science and Technology*, 38: 339-345, (2005).
9. Rahmatullah Mohammad, Ferdausi Dilara, Mollik Haque Ariful Md., Jahan Rownak, Chowdhury H. Majeedul, Haque Mozammel Wahid, A survey of medicinal plants used by Kavirajes of Chalna Area, Khulna District, Bangladesh, *Afr. J. Trad. 7*(2) (2010) 91-97.
10. Sahu N.P., Roy S.K. and Mahato S.B., Spectroscopic determination of structures of triterpenoid trisaccharides from *Centella asiatica*, *Phytochem*, 28 (1989) 2852-2854.
11. Babu TD, Kuttan G and Padikkala J., Cytotoxic and anti-tumour properties of certain taxa of Umbelliferae with special reference to *Centella asiatica* (L.) Urban, *J Ethnopharmacol*, 48 (1) (1995) 53-57.
12. Suguna L., Sivakumar P. and Chandrakasan G., Effect of *Centella asiatica* extract on dermal wound healing in rats, *Indian J. Exp. Biol.*, 34 (1996) 1208-1211.
13. Zainol M.K., Abd-Hamid A., Yusof S. and Muse R., Anti-oxidant activity and total phenolic compounds of leaf, root and petiole of four accessions of *Centella asiatica* (L.) Urban, *Food Chem.*, 81(2003) 575-581.
14. Kumar M.H.V and Gupta Y.K., Effect of different extracts of *Centella asiatica* on cognition and markers of oxidative stress in rats, *J. Ethnopharmacol*, 79 (2002) 253-260.
15. Sidhu Kiranjot, Kaur Ramthirath and Pannu Kunwarjeet, For managing editor indigenous way to maternal health care within the social system, *J. Soc. Sci.*, 13(1) (2006) 79-81.
16. Das Sandipan, Khan ML, Rabha Abhijit and Bhattacharjya DK., Ethnomedicinal plants of Manas National Park, Assam, Northeast India, *Indian Journal of Traditional Knowledge*, 8(4) (2009) 514-517.

17. Cox D. N., Rajasuriya S., Soysa P. E., Gladwin J., Ashworth A., Problems encountered in the community based production of leaf concentrate as a supplement for preschool children in Sri Lanka. *International Journal of Food Science and Nutrition*, 44: 123-132, (1993).
18. Zainol M. K. M., Determination of flavonoids in *Centella asiatica* (L.) Urban and their utilization in herbal noodles. Serdang Malaysia : University PutraMalaysia , MSc Thesis. (2004).
19. Tiek N. L., Pegaga (*Centella asiatica*)- More about its Healing Properties. *FRIM in Focus*, 2 (2): 10-11, (1997).
20. Zekaria M., dan Mohd M.A., *Traditional Malaysian Medicinal Plants*. Kuala Lumpur. Fajar Bakti Sdn Bhd. (1994).
21. Turton S., *Centella asiatica*. *Australian Journal of Herbal Medicine*, 5 (3): 57-61, (1993).
22. Huda-Faujan N., Noriham A., Norrakiah A., Babji A. S., Antioxidant activities of Water extracts of some Malaysian Herbs. *ASEAN Food Journal*, 14 (1): 61-68, (2007).
23. Brinkhaus B., Linder M., Schuppan D., Hahn E. G., Chemical, Pharmacological and Clinical Profile of the East African medicinal Plant *Centella asiatica*. *Phytomedicine*, 7 (5): 427-448, (2000).
24. Mohd Ilham A., Opportunities on the planting of medicinal and herbal plants in Malaysia. *Planter*, 74: 339-342, (1998).
25. Jayshree G., Muraleedhara G. K., Sudarslal S., Jacob V. B., Antioxidant activity of *Centella asiatica* on lymphoma-bearing mice. *Fitoterapia*, 74: 431-434, (2003).
26. Kimura Y., Sumiyoshi M., Samukawa K., Satake N., Sakanaka M., Facilitating action of asiaticoside at low doses on burn wound repair and its mechanism. *European Journal of Pharmacology*, 3: 415-423, (2008).
27. Gravel J. A., Oxygen dressings and asiaticoside in the treatment of burns. *Laval Medicine*, 36: 413-415, (1965).
28. Nalini K., Aroor A. R., Karantu K. S., Rao A., Effect of *Centella asiatica* fresh leaf aqueous extract on learning and memory and biogenic amine turnover in albino rats. *Fitoterapia*, 63 (3): 232-237, (1992).
29. Lee J, Jung E, Kim Y, Park J, Park J, Hong S, Kim J, Hyun C, Kim YS and Park D. Asiaticoside induces human collagen I synthesis through TGFbeta receptor I kinase (TbetaRI kinase)- independent Smad signaling, *Planta Med.*, 2006; 72(4):324-8.
30. Rai N., Agrawal R. C., Khan A., Inhibition of DMBA induced mouse skin carcinogenesis by *Centella asiatica* extract. *Pharmacologyonline*, 3: 536-546, (2011).
31. Schaneberg BT, Mikell JR, Bedir E and Khan IA., An improved HPLC method for quantitative determination of six triterpenes in *Centella asiatica* extracts and commercial products, *Pharmazie*, 58(6) (2003) 381-384.
32. Shukla A., Rasik A. K., Dhawan B.N., Asiaticoside – induced elevation of antioxidant levels in healing wounds. *Phytotherapy Research*, 13: 50-54, (1999).
33. Tenni,R., Zanaboni,G.,De Agostini,MP.,Rossi,A.,Bendotti,C and Cetta,G Effect of the triterpenoid fraction of *Centella asiatica* on macromolecules of the connective matrix in human skin fibroblast cultures, *Ital. J. Biochem.*, 1988 ; 37(2):69-77.
34. Babykutty S., Padikkala J., Sathiadevan P. P., Vijayakurup V., Azis T. K. A., Srinivas P., Gopala S., Apoptosis induction of *Centella asiatica* on human breast cancer cells. *African Journal of Traditional Complementary and Alternative Medicine*, 6 (1): 9-16, (2009).
35. Dr. Kousik Das Mahapatra, Dr. Baldev Kumar, 2012, Ancient and pharmacological review on *Centella asiatica* (L.) (MANDUKPARNI): A potential Herbal Pancea, *International Journal of Research and Reviews in Pharmacy and Applied science*, Dec 2(6) 1062-1072.