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REVIEW ARTICLE

Centella asiatica, an easily available medicinal plant of Manipur

Th. Tilakraj Singh[1], Sushma Phurailatpam[2], Ningthoujam Seema Devi[3], Asem Ibemhal Devi[4]
[1]Department of Botany, Ideal Girls' College, Imphal East, Manipur, India
[2]Department of Botany, Imphal College, Imphal West, Manipur, India
[2]Department of Botany, Royal Global University, Guhawati, Assam, India
[2]Department of Botany, Shree Shree Gourgobind Girls' College, Imphal East, Manipur, India

ABSTRACT
Centella asiatica is useful in skin care and cosmetics, boost memory and increase mental function and used in hair care also. The most important constituent compounds of Centella asiatica are madecassic and asiatic acid, asiaticoside and madecassoside. They all have pharmacological activity. Centella asiatica extracts have anti-inflammatory, antioxidant and antimicrobial activities. There are many studies reported on In-vivo and In-vitro utilization of the extracts of Centella asiatica. It is being reported that Centella asiatica showed potential treatment in wounds and improving mental health.
Keywords: *Centella asiatica, medicinal properties, wounds, mental health, cosmetics*

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INTRODUCTION

Centella asiatica is an herb of the family Apiaceae/ Umbellifereae. *Centella asiatica* are gregarious in waste lands and fields of valley areas. Its common name in English is *Indian pennywort*, *Brahmi* in Hindi and *Peruk* in Manipuri. It is found widely growing in many areas. Madagascar, Pakistan, central America, equatorial Africa and in the tropical region of Oceania [1]. *Centella asiatica* grows widely in India. It is weakly aromatic smelling herb. Since many hundreds of years, *Centella asiatica* has been utilized in therapeutic purposes. It is used in the traditional preparation of medicines which are being used in the treatment of a number of illnesses. It has been utilized in therapeutic purposes in different continents. A number of different ancient cultures and many groups of tribal used *Centella asiatica* for medicine. Asian traditional medicine has been using *Centella asiatica* for many years. *Centella asiatica* is used for dermatological issues such as burns, wounds, scratches and it is used also as an anti-inflammatory agent and it is described as diuretic, rheumatic, anti-pyretic, antiviral, anti-bacterial drug, it is used in treating vein insufficiency and in the improvement of cognition, to relieve anxiety and has anti-cancer property [1].

In Ayurveda medicine of India, it comes under the name of Mandukaparni. In Indian Ayurveda literature, *Centella asiatica* is one among the '*Rasayana*' drugs i.e., rejuvenator drugs and believed to be helpful in improving the skin texture, memory enhancement. The extracts of *Centella asiatica* are being utilized in the Indian pharmacology. It is used for the healing of wound and in skin problems. The skin problems may include such as leprosy, psoriasis, and eczema [2]. *Centella asiatica* has the ability to relieve, heal and recover humans from several pain and illness. Because of these properties, *Centella asiatica* is being utilized in various clinical experiments. *Centella asiatica* is used in moisturizers and wound treatments. From among the genus *Centella*, *asiatica* species are being used in the commercial drug, and they are available as *Centella asiatica hom*, *Centellae asiaticae herba* in the German market [3].

Traditional medicines from medicinal plants are increasingly used in the developed countries as well as in the developing countries also. *Centella asiatica* possesses neuroprotective properties, have nootropic (noos-mind, tropein-towards) activity with therapeutic implications for patients with memory loss [4]. In

the state of Manipur, India it is also widely used as a vegetable and in several traditional medicines and often regularly eaten as it is believed to improve mental health and also use in skin and hair care.

PLANT USAGE

Centella asiatica is found to be growing in temperate and tropical swampy places. *Centella asiatica* stems are slender with stolons creeping. Stem color is green to reddish-green. And the *Centella asiatica* plants are connecting to each other. The rounded apices are smooth in texture having palmately netted veins. The rootstock consists of rhizomes and they are found growing down vertically. Root colour is creamish and are covered with root hairs. Gregarious in waste lands and fields of valley areas. The flowers grow close to the soil surface, they are small with rounded bunches (umbels) which are white or crimson color. Each flower is enclosed in 2 green bracts partly and they are hermaphrodite. Flower is of minute size which is lesser than three mm and have 5 to 6 corolla lobes. A flower has a stamens number of 5 with styles of 2. Fruits are densely reticulate. The plant attains its maturity in 3 months' time. Whole plant is harvested manually which includes the roots as well.

Arial parts or the whole plant are being used in medicinal purposes. They are harvested throughout the year. For further usage, they are sun dried and stored in closed containers under cool and dry places. There are different modes of preparation of traditional medicine. Whole plant is chopped and simmered for decoction. Fresh leaf can be crushed for juice and paste. Powdered of dried leaves are prepared for consumption. Boiling the plant with rice water or simply by boiling only the plant are used for hair lotion in Manipur. Plant decoction is good for skin disease, leprosy, chronic ulcers, etc [5]. Its juice is being externally applied on conditions of swellings and inflammations. In Manipur, India it is also used as a vegetable, it is consumed by preparing *Chamfut* (boiled veggies) or steamed while cooking rice and used for preparing especial Manipuri dishes like *Singju* and *Kangshu*. Some families of Manipur take steamed *Centella asiatica* regularly as it is believed to improve brain power. It juice is also taken. Juice is used for fever and dried leaf powder in tuberculosis [5].

Centella asiatica, a medicinal herb appears in Ayurvedic medicine, traditional Chinese medicine, and traditional African medicine. Some people use it for treating wounds. It is being used as an ingredient in skin care products and cosmetics. The potential uses of *Centella asiatica* may include healing of wounds, cuts and burns, some skin conditions including psoriasis and scleroderma, reducing swelling in keloids and hypertrophic scars and cellulite and skin photoaging. *Centella asiatica* contains a range of active substances. They are flavonoids, triterpenoids, and phenolic acids and has have anti-inflammatory and antioxidant properties. It was also suggested that it may have anticarcinogenic properties due to the present of asiatic acid [6].

CHEMICAL COMPOSITIONS

Centella asiatica contains tannins, flavonoid, amino acids, volatile oils, sugars and phytosterols [1]. Triterpenoid saponin was most important constituent isolated from *Centella asiatica* and it is known as centelloids. Saponins may report for one percent to eight percent of all the constituents of *Centella asiatica.* HPLC-UV method can be used for determination. Centellosides compounds occurring in *Centella asiatica* include asiatic acid, madecassic acid, asiaticoside and madecassoside and triterpenic acids such as brahmic acid, terminolic acid, madasiatic acid, centellic acid and their glycosides like centelloside, brahminoside and madasiaticoside [7].

The glycoside and asiaticoside are shown to be active in treating leprosy [5]. Many research and investigations are going on for its use in treating many other skin and mental conditions. HPLC for quantitative determination of the bioactive terpene acids in *Centella asiatica* simultaneously was described [8]. The bioactive terpene acids include madecassic acid, asiatic acid and their respective glycosides, madecassoside & asiaticoside.

Leaves of *Centella asiatica* leaves were undertaken and studied triterpene composition and bioactivity. Bioactivity study includes of collagen enhancement, antioxidant activity assay, anticellulite and UV protection capacity studies [9]. *Centella asiatica* triterpenes were measured using HPLCPAD for the simultaneous determination of asiatic acid, madecassic acid, asiaticoside and madecassoside [9]. Significant madecassoside of 3.10 ± 4.58 milligram/mL and asiaticoside of 1.97 ± 2.65 milligram/mL but lower asiatic and madecassic acid were obtained. The human dermal fibroblast cells (ATCC CRL-2450) were cultured in DMEM with fetal bovine serum, L-glutamine, and antibiotics. The cells were seeded using the appropriate procedure. The confluent fibroblast cells were treated with *Centella asiatica* extract. Several concentrations of extract were used and vitamin C was taken as positive control. Then the treated cells were harvested and extracted using acetic acid with the addition of protease inhibitor cocktail. The cell lysate was determined by using method of sirius red staining. Human collagen Type-I was used as the

standard and the blank as acetic acid and absorbance was taken. The highest collagen synthesis was obtained at *Centella asiatica* extracts 50 mg/mL [9]. The *Centella asiatica* extracts antioxidant activity was obtained to be 84 % in comparison with the grape seed extract, 83% and vit C, 88%. Lipolytic activity was obtained by the releasing of glycerol, 115.9 µmol/L at 0.02 percent concentration. *Centella asiatica* extract was found to exhibit similar UV protection effect to octyl methoxy cinnamate at the concentration 10 percent.

Essential oil of *Centella asiatica* was analysed by using Gas chromatography–mass spectrometry (GC-MS). Essential oil of *Centella asiatica* revealed eleven monoterpenoid hydrocarbons, nine oxygenated monoterpenoids, 14 sesquiterpenoid hydrocarbons, 5 oxygenated sesquiterpenoids and 1 sulphide sesquiterpenoid [10]. *Centella asiatica* essential oil was observed to exhibit antibacterial activities against gram positive bacteria such as *Staphylococcus aureus* and *Bacillus subtilis* and gram-negative bacteria such as *Pseudomonas aeruginosa*, *Escherichia coli* and *Shigella sonnei* [10].

BIOLOGICAL ACTIVITY

The effects of *Centella asiatica* upon pain (antinociception) and inflammation in rodent models were evaluated. Aqueous *Centella asiatica* extract revealed good antinociceptive activity [11]. The activity was similar to aspirin statistically however found to be lesser potent than morphine. The extract was observed to show anti-inflammatory activity also and the effect was similar to mefenamic acid (non-steroidal anti-inflammatory drug) statistically.

Preliminary screening on 3 months old male Swiss albino mice showed that oral administration of *Centella asiatica* for 15 days enhanced the learning and memory. It was studied by using the radial arm maze test. Radial arm maze test is widely utilized to test spatial memory. The albino mice were treated with 200 milligram/kilogram of *Centella asiatica* for fifteen days starting from the 15th day to 30th day postpartum orally and the nootropic effect was examined on the day 31 and six months postpartum [12]. Performance of mice was showed to improve in radial arm maze and hole board tests and acetylcholine esterase activity was observed to be increased in the hippocampus and also the dendritic arborization of hippocampal CA3 neurons was found to be increased. These proved that treatment during postnatal developmental stage with extract of *Centella asiatica* may influence the neuronal morphology and help in promoting the higher brain function of mice [12]. Radial arm maze test observed to increase dose-dependent increase which showed that extract of *Centella asiatica* enhanced cognitive function of mice.

Centella asiatica crude methanolic extract was observed to have antioxidant activity on cell line-induced lymphoma-bearing mice. Orally treatment with 50 milligram per kilogram per day of extract the for fourteen days observed the increased the anti-oxidant enzymes such as SOD, GSHPx and anti-oxidants namely GSH and ascorbic acid showed decreased in lymphoma-bearing mice [13].

Alcoholic *Centella asiatica* extract showed increased in the cellular proliferation in rats at the wound site. Collagen synthesis was also increased by the increased of protein, DNA and collagen of granulation tissues. Better and quicker maturation and crosslinking of collagen was obtained in the rats which were treated with *Centella asiatica* extract. It was indicated by the high stability of acid soluble collagen and the increase of aldehyde content and tensile strength [14]. The wounds treated with extracts epithelialized faster and rate of wound contraction was found to be higher in comparison to control wounds which showed *Centella asiatica* produced different mode of actions on different phases of repairing the wound.

Antioxidative activity of different *Centella asiatica* extracts from different parts of the plants were evaluated. The plants parts undertaken were leaves, petioles and roots. Antioxidative activity of the extracts were determined by linoleic acid model system and thiobarbituric acid test. Ethanol extract of all the *Centella asiatica* plant parts exhibited significantly better antioxidative property than the water and petroleum ether activity was negligible [15].

Male Wistar rats were undertaken for studying the effect on learning and memory. The aqueous extract of *Centella asiatica* whole plant showed learning and memory improvement both step through paradigms and shuttle box and observed that *Centella asiatica* aqueous extract has cognitive enhancing effect and involved an antioxidant mechanism [16].

It is estimated that around 6 million population suffer from chronic wounds globally. Healing of wound is process for regenerate tissues. The process of wound healing may be divided into 3 main phases. The phases are inflammation, proliferation and maturation Reports on various *in vitro* and *in vivo* model experiments showed that different extracts of *Centella asiatica* and its bio active compound namely asiaticoside possess wound healing property. A formulation was developed with accelerated wound healing effect to determine efficacy of asiaticoside containing hydrogel in rabbits and observed that asiaticoside added hydrogel was effective in in the process of wound healing in rabbits [17]. Fraction rich in asiaticoside was prepared from aerial part of *Centella asiatica* and hydrogel was prepared. The

hydrogel was used in the investigation of wound healing by *in vivo* incision model using rabbits The hydrogel formulation showed no signs of irritation on the skin of rabbits and the rate of wound healing was observed to be enhanced by fifteen percent faster than commercially available cream and forty percent faster than the wounds left untreated. The process of healing of skin was found to observe in all the wounds marked. Formation of a thick epithelial layer, keratin and moderate formation of granulation tissues, fibroblasts were observed and collagen with no fibrinoid necrosis was seen.

Centella asiatica is being reported for the useful effects on several neurological disorders. The role of *Centella asiatica* extracts on anxiety disorder in male was evaluated [18]. BPRS, Hamilton's Brief Psychiatric Rating Scale was used for screening. Altogether, 35 participants (eighteen male and fifteen females with an average age thirty-three years were given medication with *Centella asiatica* in a fixed dose regime. Questionnaires using psychological rating and queries related to stress were used and found to observe that *Centella asiatica* not only attenuated disorders which are related to anxiety and also reduced stress phenomenon and its correlated depression [18]. Their findings suggested that *Centella asiatica* may be helpful in treating generalized anxiety disorder and may also be used as anxiolytic agent with further studies.

Methanol extract of *Centella asiatica* was prepared from the aerial parts. 3,5-Di-*O*-caffeoyl quinic acid, 1,5-di-*O*-caffeoyl quinic acid, 3,4-di-*O*-caffeoyl quinic acid, 4,5-di-*O*-caffeoyl quinic acid and chlorogenic acid, together with asiaticoside, kaempferol, quercetin-3-*O*-b -D-glucoside, kaempferol-3-*O*-b -D-glucoside and quercetine were all obtained from the methanolic extract [19]. 3,5-di-*O*-caffeoylquinic acid observed to show inhibition of shear-induced platelet activation and dynamic coagulation [19].

Centella asiatica aqueous extract was found to contain 2.86 gram per 100 gram of phenolic and 0.361 gram per 100 gram of flavonoid compounds (Pittella et al., 2009). According to the study by Pittella et al. [20], *Centella asiatica* extract was observed to show good activity against MDA MB-231 (human breast cancer), B16F1 (mouse melanoma) and C6 (rat glioma) cell lines, with IC50 values of 648.0, 698.0 and 1000.0 μgram per mL, respectively.

CONCLUSIONS

Centella asiatica is used in treating skin related problems. It is used for burn, wound and hypertrophic scar. *Centella asiatica* also helps in improving mental function. Many bioactive compounds are obtained to be present in *Centella asiatica* are pentacyclic triterpenes, asiatic acid, madecassic and madecassoside acids. *Centella asiatica* is an important ingredient in some of the cosmetics and skin care products a cosmetic. It is being used in hair care also. Applications of *Centella asiatica* in industries such as food and pharmaceutical are to be analysed and studied in depth. Further, clinical trials are suggested for therapeutic properties of *Centella asiatica*.

REFERENCES

1. Brinkhaus B, Lindner M, Schuppan D, Hahn EG (2000). Chemical, pharmacological and clinical profile of the East Asian medical plant *Centella asiatica*. Phytomedicine 75: 427-48.
2. Gupta A P, Gupta M M and Sushil Kumar (1999). High performance thin layer chromatography of asiaticoside in *Centella asiatica. J. Indian Chem. Soc*., 76: 321-322.
3. Zainol N A, S C Voo, M R Sarmidi and R A Aziz (2008). Profiling of *Centella asiatica* (L.) Urban extract. The Malaysian Journal of Analytical Sciences 12 (2): 322 -327
4. Shinomol GK, Muralidhara, Bharath MM (2011). Exploring the Role of "Brahmi" (*Bacopa monnieri* and *Centella asiatica*) in Brain Function and Therapy Recent Pat Endocr Metab Immune Drug Discov. 2011 Jan;5(1) 33-49. doi:10.2174/187221411794351833. PMID: 22074576
5. https://medicinalplants.co.in/peruk/
6. https://www.medicalnewstoday.com/articles/centella-asiatica-for-skin
7. James J, Dubery I. (2011). Identification and quantification of triterpenoid Centelloids in *Centella asiatica* (L.) urban by densitometric TLC. J Planar Chromatogr; 24: 82-7.
8. Inamdar P K, R D Yeole, A B Ghogare, N J de Souza (1996). Determination of biologically active constituents in *Centella asiatica* Journal of Chromatography A 742(1-2): 127-130 https://doi.org /10.1016/0021-9673(96)00237-3.
9. Hashim P, H Sidek, Md Helme M. Helan, A Sabery, Uma Devi P and Mohd Ilham (2011). Triterpene Composition and Bioactivities of *Centella asiatica*. Molecules 16: 1310-1322 doi:10.3390/ molecules16021310
10. Oyedeji O A and Afolayan A J (2005). Chemical composition and antibacterial activity of the essential oil of *Centella asiatica* growing in South Africa Pharmaceutical Biology 43 (3): 249-252
11. Somchit M N, Sulaiman M R, Zuraini A, Samsuddin L, Somchit N, Israf D A, Moin S. (2004). Antinociceptive and antiinflammatory effects of *Centella asiatica*. Indian J Pharmacol;36:377-380

12. Sulochana B Rao, M Chetana, P Uma Devi (2005) *Centella asiatica* treatment during postnatal period enhances learning and memory in mice, Physiology & Behavior. 86(4): 449-457 https://doi.org/10.1016/j.physbeh.2005.07.019.
13. Jayashree G, G Kurup Muraleedhara, S Sudarslal, V B Jacob (2003). Anti-oxidant activity of *Centella asiatica* on lymphoma-bearing mice, Fitoterapia. 74(5):431-434 https://doi.org/10.1016/S0367-326X(03)00121-7
14. Suguna L, Sivakumar P, Chandrakasan G (1996). Effects of *Centella asiatica* extract on dermal wound healing in rats. Indian J Exp Biol. 34(12) 1208-1211. PMID: 9246912
15. Abdul Hamid A, Z Md Shah, R Muse, S Mohamed (2002) Characterisation of antioxidative activities of various extracts of *Centella asiatica* (L) Urban, Food Chemistry 77(4):465-469 https://doi.org/10.1016/S0308-8146(01)00384-3.
16. Veerendra K M H and Gupta Y K (2002) Effect of different extracts of *Centella asiatica* on cognition and markers of oxidative stress in rats. Journal of Ethnopharmacology 79(2): 253-260 https://doi.org/10.1016/S0378-8741(01)00394-4
17. Ahmed Sh, A Taher, M Mandal U.K. *et al.* (2019) Pharmacological properties of *Centella asiatica* hydrogel in accelerating wound healing in rabbits *BMC Complement Altern Med* **19**, 213 https://doi.org/10.1186/s12906-019-2625-2.
18. Jana U, TK Sur, LN Maity, PK Debnath and D Bhattacharyya (2010) A clinical study on the management of generalized anxiety disorder with *Centella asiatica.* Nepal Med Coll J 12(1): 8-11
19. Toshiko S, Kohei K, Yin A, Tomomi O and Junichiro Y (2007) The Anti-thrombotic active constituents from *Centella asiatica Biol. Pharm. Bull.* 30(5) 935-940
20. Pittella F, R C Dutra, D D Junior, M T P Lopes and Nádia R Barbosa (2009) Antioxidant and Cytotoxic Activities of *Centella asiatica* (L) Urb. *Int. J. Mol. Sci.* 2009, *10*, 3713-3721; doi:10.3390/ijms10093713