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Review Article

Centella Asiatica (Indian Pennywort): A Review

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ABSTRACT

Triterpenoids and saponins are significant chemical ingredients that are thought to exert these pharmacological effects. Aside from that, it is used to treat diarrhoea, fever, amenorrhea, anxiety, and cognitive consequences.' or Asiatica Gotu kola is sometimes confused with kola nut, which contains no CNS stimulants like caffeine and has no stimulating effect. It was employed in the ayurveda system of medicine for hundreds of years before it was described in the 'Sushruta Samhita,' an old ayurvedic medical treatise. It is also used by the Indonesian and Javanese, and Chinese ancient peoples were aware of it over 2000 years ago. This article discusses Centella asiatica's Phytochemistry, Traditional applications, Pharmacological effects, and Toxicology. Plant-based medication discovery has piqued the interest of academics, particularly those utilised in traditional therapies. Centella asiatica is a traditional Ayurvedic medicine used to treat a range of ailments in India and throughout Asia. The aerial portions and roots are utilised for medical purposes, and its chemical contents have antibacterial, anti-inflammatory, anticancer, neuroprotective, antioxidant, and wound healing properties.

Key Words: *Centella asiatica, Pharmacology, Chemical constituents, Therapeutic usage.*

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INTRODUCTION

Centella asiatica is a member of the Apiaceae family and is commonly known as Indian pennywort or Gotu kola in western countries. This herbal medicine is known as Brahmi in traditional medicine systems, Gotu kola in Europe and America, Mandookaparni in Ayurveda, and Brahmi in Unani. Because both herbs are sold under the name 'Brahmi,' it was mistaken for another plant known as Bacopa monnieri Wettst in India. The problem was later resolved by assuming that Brahmi is B. monnieri and Mandookaparni is C. asiatica [1]. It has been observed growing in Pakistan, Central America, Madagascar, India, equatorial Africa, and Oceania's tropics [2]. Because of the plant's numerous herbal characteristics, CA and CA preparations or extracts were included in the Indian Pharmacopoeia in the nineteenth century, and were afterwards included in other pharmacopoeias. According to Polish and European Pharmacopoeas, this herb is a dried, fragmented plant of aerial sections of Centella asiatica that contains at least 6.0 percent total triterpenoids derivatives expressed as asiaticoside [2,3,4]. C. Asiatica plants have been used for hundreds of years to aid in the healing of minor wounds, scratches, burns, and hypertrophic wounds, particularly in dermatological conditions and as an anti-inflammatory medicine for eczema. It is employed in traditional Asian medicine as a diuretic, antibacterial, and antiviral agent for the treatment of venous insufficiency, anti-rheumatic agent, cognitive enhancement, antipyretic agent, anxiety alleviation, and anti-cancer agent [2,4,5]. *C. Asiatica* was also used to treat epilepsy, hysteria, leprosy, itching, and bug bites [5].

Morphology of plant

It is a little perennial herbaceous creeper that grows up to 15 cm tall and is found in tropical and subtropical areas of India up to 600 m above sea level. It belongs to the umbelliferous family. The plant has also been seen growing at elevations of up to 1200 metres in Mount Abu (Rajasthan) and 1550 metres in Sikkim. It can be found in most subtropical and tropical nations, including South Africa, Pakistan, Sri Lanka, India, Madagascar, the South Pacific, and the east of Europe. CA is linked to approximately 20 species that occur in most tropical or humid pantropical environments, including paddy fields and the Rocky Mountains [6,7]. It is a plant that grows in and near water and has no flavor or odor. Its leaves look like small propeller or fan shaped green in color with light pink, light purple or white flowers and fruits are oval shaped (Fig. 1 and 2) the entire plant is used as medicine [8]. It is commonly used as a blood purifier and to treat high blood pressure, improve memory, and promote longevity. CA is one of the most significant herbs in Ayurveda for stimulating nerve and brain cells. Eastern therapists have relied on CA to treat emotional disorders, such as depression, thought to be related to physical problems [9,10]. Western medicine reported that in the mid-twentieth century, CA and its ethanolic extract had promising results in the treatment of leprosy [11].

Fig.1; *Centella asiatica*

CHEMICAL CONSTITUENTS

The herb has long been used in traditional medicine to cure a range of illnesses. Chemically recognised, resulting in therapeutic qualities. Apart from being high in flavonoids and terpenoids, the primary compounds responsible for pharmacological significance include asiatic acid, asiaticoside, and madecassoside [12]. Centelloid was a name used to describe various elements of secondary metabolites generated by plants, the majority of which were pentacyclic triterpenoid saponins [13]. On gas chromatography-mass spectrometry (GC-MS) investigation, P-cymene (44%) and other volatile chemicals were discovered in significant amounts in the essential oil of C. asiatica [14]. Centellin, asiatic, and centellicin were isolated from the aerial part of the plant, and further, their structures had been determined using 2D nuclear magnetic resonance technique [15]. From plant extract using high-performance liquid chromatography to identify bioactive compounds, madecassoside, asiaticoside, madecassic acid, and asiatic acid were found in the significant amount [16]. A quantitative estimation of triterpenoids showed highest asiaticoside content (6.42%) in leaf samples collected in Mangoro region [17]. New triterpene and a saponin, 2α,3β,23-trihydroxyurs-20-en-28-oic acid and 2α,3β,23-trihydroxyurs-20-en-28-oic acid O-α-l-rhamnopyranosy-(1→4)-O-β-d-glucopyranosyl(1→6)-O-β-d glucopyranosyl ester, have been isolated from the aerial part of *C. asiatica*, and their structures were determined using spectral methods [18].

PHARMACOLOGICAL USES

Several research workers have reported different biological activities of *C. asiatica*. These have been given under following headings;

Wound Healing

Madecassol, an extract of this plant containing madecassic acid, asiatic acid and Asiaticoside accelerates cicatrisation and grafting of wounds [19]. Asiaticoside promotes fibroblasts proliferation and extracellular matrix synthesis in wound healing [20].

Cytotoxic and Antitumour

Oral administration of the crude extract of *C. asiatica* and its partially purified fractions induced apoptosis in solid and Ehrlich Ascites tumour and increased the life span of these tumours bearing mice [21,22]. Asiatic acid was found to have anticancer effect on skin cancer [23].

Memory Enhancing

Aqueous extract of the herb showed significant effects on learning and memory and decreased the levels of norepinephrine, dopamine and 5-HT and their metabolites in the brain [24]. *Centella asiatica* contains brahmicacid, isobrahmic acid, brahminoside and brahmoside. It has psychotropic, sedative and anticonvulsant properties. It is also useful in dementia, mental disorders and anxiety. Thus, Mentat a Polyherbal formulation where all the herbs act in synergistic manner produces improvement of memory, attention and concentration in children with learning disability [25].

Cardioprotective

The alcoholic extract of the whole plant showed strong cardioprotective activity in limiting ischemia-reperfusion induced myocardial infarction in rats [26].

Radioprotective

Centella asiatica could be useful in preventing radiation induced behavioral changes during clinical radiotherapy [27].

Antidepressant

The total triterpenes had antidepressant activity and caused significant reduction of the corticosterone level in serum [28-29].

Sliming

C. asiatica extracts showed a dramatic increase in the cyclic adenosine monophosphate content with a subsequent rise in the nonesterified fatty acids content in human adipocytes [30].

Striae gravidarum

A cream containing Centella extract, α-tocopherol and collagen-elastin hydrolysates was associated with less women developing stretch marks [31].

Immunomodulating

Pectin isolated from *C. asiatica* showed immunostimulating activities49 and triterpenoids saponins [32] and methanol extracts showed preliminary immunomodulatory effect [33].

Antiprotozoal

Alcoholic extract of the entire plant showed antiprotozoal activity against *Entamoeba histolytica* [34].

Mental-retardation

Centella asiatica tablets administered orally to mentally retarded children showed significant increase in general ability and behaviour patterns [35, 36, 37].

Antitubercular and Antileprotic

Asiaticoside has been shown to be useful in the treatment of leprosy [39] and certain types of tuberculosis [19]. Clinical trials conducted on normal adults showed that the drug increased the level of RBC, blood sugar, serum cholesterol and total protein. The increase in the mean blood urea level [40, 41]. It has a calming effect on the body and supports the central nervous system.

CONCLUSION

C. asiatica is a promising plant with a variety of medicinal applications. It is commonly acknowledged that plants have neuroprotective properties and can aid in brain development. Plants have been shown to have low toxicity and increased efficacy in clinical treatment, with notable activities such as anticancer, antibacterial, antifungal, anti-inflammation, neuroprotection, antioxidant, wound healing, and antidepressant, as indicated in the preceding text. Because C. asiatica is an endangered species, plant tissue culture mass propagation can be beneficial, and callus and suspension culture techniques can be used to extract secondary metabolites. Germplasm conservation could be a viable option for preserving this valuable plant. More research is needed to identify and characterise the chemical components responsible for a wide spectrum of therapeutic activities. The plant has a wide range of applications due to the presence of several bioactive compounds. The plant could be a safer alternative in the development of new medications. More study is needed to corroborate the activities mentioned in ancient texts, followed by clinical investigations to ensure that they are safe for human use.The tissue culture techniques proposed in this work can be used for propagation as well as conservation of the germplasm of this medicinally essential plant, which can increase the rate of multiplication while decreasing the time and cost of production. Scientific and social validation of indigenous knowledge can serve to provide both scientific and social sanction, as well as increase the likelihood of future generations using alternative sources of medicine.

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