ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Review Article

COMPREHENSIVE LITERATURE REVIEW OF *MANDUKPARNI* (*CENTELLA ASIATICA*) W.S.R. TO ITS MEDICINAL PROPERTIES

Kumar Naveen[1*], Chaubey Suresh[2], Singh Sanjay Kumar[3], Tewari Ramesh Chandra[4]

*[1]PG Scholar, [2]Professor, Dept. of Dravyaguna, Rishikul Campus Haridwar, Uttarakhand Ayurved University, Uttarakhand.
[3]Professor, Dept. of Rog-Nidan, Rishikul Campus Haridwar, Uttarakhand Ayurved University, Uttarakhand, India.
[4]Professor, Dept. of Agad-Tantra, Rishikul Campus Haridwar, Uttarakhand Ayurved University, Uttarakhand, India.

ABSTRACT

Ayurveda practitioners have managed and cured physical as well as mental health related disorders when there was no other stream of medicine evolved. The science of Ayurveda has evolved and emerged from ancient times to contemporary era as one of the most significant approach in medicine to treat various diseases. Ayurveda scholars from ancient times have invented and documented various medicinal herbs and their preparation and formulations to be used for the treatment. All *Samhita Granths, Chikitsa Granths* and *Nighantus* have quoted many such drugs with their specific uses and indications in particular diseases. Various *Nighantus* are rich source of knowledge regarding identification, place of origin and indications of various medicinal plants. Later on, with the evolution of technology, more researches were done on the medicinal plants and their utilities in specific disorders were re-evaluated. *Mandukparni* is one such drug which has been quoted many times in ancient texts as well as in various *Nighantus* and then more research work was done regarding the medicinal properties of the plants in different ailments. The herb is indicated as *Medhya* and *Rasayana* primarily by nearly all Ayurvedic texts including *Nighantus*. *Mandukparni* is named *Centella asiatica* in binomial system of nomenclature. Modern researches have also signified the use of this herb as a potent cognitive drug and having anti-oxidant properties. Alongside, the herb is indicated in many other diseases in ancient and modern texts. This article is an attempt to throw a light on the mentions, formulations and indications of this herb as described in all available texts and research works.

KEYWORDS: *Mandukparni, Centella asiatica, Medhya* Herbs, Cognitive drugs.

INTRODUCTION

Mandukparni is known as one of the most significant *Medhya* herbs described in *ayurvedic* treatises. *Acharya Charak* has described *Mandukparni* in four *Medhya Rasayana* alongside *Shankhpushpi, Guruchi* and *Yashtimadhu*[1]. After *Charak Samhita*, all texts signified the importance of *Mandukparni* as a *Medhya* and *Rasayana* herb followed by *Nighantus* and then modern researches. Modern researches have approved the herb as a major cognitive and nootropic drug alongside many other therapeutic properties. The drug has been researched for its anti-depressant, anxiolytic, sedative, hypotensive and anti-oxidant properties.

Review of Literature from Ancient Texts[2]

Shaunakiya Athrvaveda: *Mandukparni* has been described as *Manduki*. *Sayana* has named the plant as *Mandukparni*.

Kaushiksutra: In this text, *Mandukparni* is mentioned as *Aushadhi* by its name separately.

Review of Literature from *Samhita Grantha*

1. *Charak Samhita* (1000 BC-4TH CENT A.D.)[3]: It is the oldest treaties among all the *Ayurvedic Samhita granthas.* It is composed by *Maharshi Agnivesha* (1000 B.C.), Redacted by *Acharya Charak* (200 B.C.) and reconstructed by *Acharya Dridhabala* (4th cent. A.D.). *Acharya Charak* has mentioned *Mandukparni* 9 times, 2 times in *Sutra sthan* followed by once in *Viman Sthan* and 6 times in *Chikitsa sthan* as described below.

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*Ch. Su. 4/50*	*Mahakashaya*	*Vayasthapana*	*Int.*
2.	*Ch. Su. 27/95*	*Shaak*	*Kapha – Pitta shamak*	*Int.*
3.	*Ch. Vi. 8/143*	*Tikta-skandha*	*Kapha – Pitta shamak*	*Int.*
4.	*Ch. Chi. 1(i)/48*	*Pratham Brahm rasayana*	*Rasayana*	*Int.*
5.	*Ch. Chi. 1(i)/58*	*Dwitiya Brahm rasayana*	*Rasayana*	*Int.*
6.	*Ch. Chi.1(iii)/30*	*Medhya rasayana*	*Rasayana*	*Int.*
7.	*Ch. Chi. 11/92*	*Nagbala Kalpa*	*Urahkshata*	*Int.*
8.	*Ch. Chi. 13/181*	*Shaak*	*Udar roga*	*Int.*
9.	*Ch. Chi 23/225*	*Shaak*	*Visha Chikitsa*	*Int.*

2. *Sushruta Samhita* (1000 B.C.-5th Cent.A.D.)[4]: This *Samhita* was written by *Vriddha Sushruta* (1000 B.C.), he was contemporary to *Agnivesha.* The treaties was redacted by *Sushruta* in 2nd century A.D. and revised by *Nagarjuna* in 5th century A.D. This treaty mainly concerned with *Shalya & Shalakya*. In this *Samhita, Mandukparni* has been mentioned 7 times; 5 times in *Sutra sthan,* once in *Chikitsa sthan* and once in *Uttar Tantra*.

S. No.	References	Formulation	Indication	Uses (Int./Ext.)
1.	*Su. Su. 20/4*	*Shaak*	*Sarva Pathya*	*Int.*
2.	*Su. Su. 42/22*	*Tikta varga*	*Pathya*	*Int.*
3.	*Su. Su. 46/262*	*Shaak*	*Rakta-pitta, Hridya, Kushtha*	*Int.*
4.	*Su. Su. 46/264*	*Shaak*	*Pita Vikar*	*Int.*
5.	*Su. Su. 46/337*	*Shaak*	*Pathya*	*Int.*
6.	*Su. Chi. 9/5*	*Telpak*	*Kushtha*	*Int.*
7.	*Su. U. 28/4*	*Swaras*	*Rasayana*	*Int.*

3. *Astanga Samgraha* (6TH CENT. A.D.)[5]: *Ashtang Sangraha* was written by *Maharshi Vridha Vagabhatta.* He has mentioned *Mandukparni* 5 times in *Uttar Tantra* to be indicated in various diseases as described below-

S. No.	References	Formulation	Indication	Ext./ Int.
1.	*A.S. U. 42/70*	*Karketanadi Dravya*	*Sarpavisha*	*Ext*
2.	*A.S. U. 49/23*	*Amalaki Rasayana*	*Rasayana*	*Int.*
3.	*A.S. U. 49/42*	*Rasayana*	*Medhya Rasayana*	*Int.*
4.	*A.S. U. 49/46*	*Brahmiadi Yoga*	*Rasayana*	*Int.*
5.	*A.S. U. 49/173*	*Guggulu mansrasa + Mandukparni*	*Medhavridhi*	*Int.*

4. *Astanga Hridaya* (7th Cent.A.D.)[6]: It was composed by *Acharya Vagbhatta*. He has mentioned *Mandukparni* 5 times in this Samhita; once in *Sutra sthan,* once in *Chikitsa sthan* and 3 times in *Uttar Tantra* as tabulated below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*A.H.Su 6/76*	*Ptoladi shaak*	*Kapha Pitta nashak*	*Int.*
2.	*A.H.Chi. 3/120*	*Nagbaladi ghrit*	*Kaas*	*Int.*
3.	*A.H.U. 39/18*	*Brahmrasayana*	*Rasayana*	*Int.*
4.	*A.H.U. 39/44*	*Medhya Rasayana*	*Medhya*	*Int.*
5.	*A.H.U. 39/164*	*Mandukparni ghritpak*	*Ayushya*	*Int.*

5. *Kashyap Samhita* (600 B.C. – 7th Cent.A.D.)[7]: *Kashyap Samhita* was composed by *Maharshi Kashyap* and recomposed by *Acharya Vatsya.* This *samhita* is not found in complete form today. This treaty mainly deals with Pediatric disorders. *Mandukparni* has been mentioned once in this *Samhita* as described below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*Ka. Su. 18/29*	*Mandukparni* with honey or *Ghrit*	*Medhya*	*Int.*

6. Bhavprakash Samhita. (16th Cent. A.D.)[8]: *Bhavprakash Samhita* was written by *Bhavmishra.* He has described *Mandukparni* 2 times in *Chikitsa sthan*, once each in *Jwara* and as *Rasayana* as tabulated below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*Bha. Chi. 1/684*	*Mradwika Kwath*	*Chitbhrama Sannipatajwara*	*Int.*
2.	*Bha. Chi. 73/5*	*Mandukparni swaras*	*Medhya Rasayana*	*Int.*

Review of Literature in *Chikitsa Grantha*

1. *Chakradutta-*(11th Cent. A.D.)[9]: In *Chakradutta*, the drug has been mentioned 2 times as *Rasayana* in different formulations as described below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*C.D. 66/14*	*Mandukparni Swaras*	*Medhya Rasayana*	*Int.*
2.	*C.D. 66/95*	*Abraksanskar bhsma*	*Rasayana*	*Int.*

2. *Yogaratnakar* (17th cent. A.D.)[10]: The *Chikitsha grantha Yogaratnakar* was composed by *Vaidya Sri Laxmipatti Ayurvedacharya.* He has described *Mandukparni* only once in *Uttarardha* as *Medhya*. The description is given below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*Y.R.U. 499/2*	*Mandukparnyadi yog*	*Medhya*	*Int.*

3. *Bhaishajya Ratnavali* (18th cent. A.D.)[11]: This important *Chikitsha granth* was composed by *Shri Govind Das Ji.* He has mentioned *Mandukparni* 26 times in this treaty. *Mandukparni* has been indicated in various diseases in various formulations as tabulated below-

S. No.	References	Formulation	Indication	Uses (Ext./Int.)
1.	*B. R. 5/308*	*Dardurdaladi Kwath*	*Chitbhram Sannipat jwara*	*Int.*
2.	*B. R. 5/422*	*Guruchyadi Swaras Putpak*	*Vaat-pittaj Jirna Jwara*	*Int.*
3.	*B. R. 5/576*	*Achintya Shakti Rasa*	*Sarva Jwarahar*	*Int.*

4.	*B. R. 5/624*	*Tralokyasundar Rasa*	*Sannipata Jwara*	*Int.*
5.	*B. R. 5/656*	*Paaniya Vatika*	*Sannipata Jwara*	*Int.*
6.	*B. R. 5/671*	*Paaniya Vatika Sidhhaphala*	*Udravayukta Sannipata Jwara*	*Int.*
7.	*B. R. 6/96*	*Abhrak Vatika*	*Jwaratisar, Atisar, Sutikajwara, Vishmajwara*	*Int.*
8.	*B. R. 8/303*	*Shri Vaidyanath Vatika*	*Agnimaandya, Sangrahni*	*Int.*
9.	*B. R. 8/310*	*Aamparptika*	*Atisar, Grahni, Mandagni*	*Int.*
10.	*B. R. 8/316*	*Rasabhravati*	*Grahni, Jwara, Atisar, Kshaya, Kaas*	*Int.*
11.	*B. R. 8/325*	*Mahabhravati*	*Grahni, Atisar, Sutikajwara, Kaphaj roga*	*Int.*
12.	*B. R. 8/511*	*Purnakalavatika*	*Grahni, Atisar, Agnimaandya, Daah*	*Int.*
13.	*B. R. 8/605*	*Daadimadi Tail*	*Asadhya Grahni, Prameh, Arsha*	*Int.*
14.	*B. R. 12/47*	*Kaamlantaklauh*	*Kaamla, Pandu*	*Int.*
15.	*B. R. 14/84*	*Yakshmantaklauh*	*Rajyakshma, Kaas, Swarabhang, Urahkshat, Kaas*	*Int.*
16.	*B. R. 15/93*	*Brihad Rasendra Gutika*	*Kaas, Shwas, Kshaya*	*Int.*
17.	*B. R. 27/138*	*Guruchi Tail*	*Vaatrakta, Kushtha, Kandu*	*Ext.*
18.	*B. R. 31/43*	*Vaidyanath Vati*	*Udara, Aanah, Udavrita, Gulm, Krimi roga*	*Int.*
19.	*B. R. 37/181*	*Briht Somnath Rasa*	*Prameh, Mutrakrichhra, Mutraghaat*	*Int.*
20.	*B. R. 42/106*	*Sudhanidhi*	*Shotha, Grahni, Pandu, Agnideepak*	*Int.*
21.	*B. R. 56/76*	*Kshudhavati Gutika 2*	*Mandagni, Grahni, Amlapitta, Prinamshula, Agnipradeepak*	*Int.*
22.	*B. R. 56/82*	*Kshudhavati Gutika 3*	*Amlapitta, Parinamshula, Arsha, Aruchi, Mandagni*	*Int.*
23.	*B. R. 69/65*	*Sutikari Rasa*	*Sutika Roga*	*Int.*
24.	*B. R. 71/111*	*Baalrogantak Rasa*	*Balako ke sampurna roga*	*Int.*
25.	*B. R. 72/78*	*Visharoga*	*Vishroga me pathya*	*Int.*
26.	*B. R. 73/8*	*Rasayana*	*Rasayana*	*Int.*

Review of Literature from various *Nighantu*

S.No.	***Nighantu***	***Varga***
1.	*Saushrut Nighantu*[12]	*Veertaradi Gana*
2.	*Astanga Nighantu*[13]	*Veertaradi Gana*
3.	*Dhanvantari Nighantu*[14]	*Karveeradi Varga*
4.	*Nighantu Sesh*[15]	*Shaak kaand*
5.	*Shodhal Nighantu*[16]	*Karveeradi Varga*
6.	*Madhava dravyaguna*[17]	*Shaak Varga*
7.	*Abhidhan ratnamala*[18]	*Tikta skanda*
8.	*Hridaydeepak Nighantu*[19]	*Chatushpad Varga*
9.	*Kaiyadeva Nighantu*[20]	*Aushadhi Varga*
10.	*Bhavprakash Nighantu*[21]	*Guruchyadi Varga*
11.	*Gunratnamala*[22]	*Guruchyadi Varga*
12.	*Raj Nighantu*[23]	*Shatahvadi Varga*
13.	*Rajvallabha Nighantu*[24]	*Madhyahnika paricched*
14.	*Priya Nighantu*[25]	*Shatpushpadi Varga*
15.	*Nighantu Adarsha*[26]	*Jeerakadi varga*
16.	*Dravyaguna samgrah*[27]	*Shaak Varga*

Review of Literature from Modern Texts

Mandukparni* (*Centella asiatica)

Taxonomic Description[28]

Kingdom: Plantae
Order: Apiales
Family: Apiaceae
Subfamily: Mackinlayoideae
Genus: Centella
Species: asiatica

Basonym: *Mandukparni*
Latin Name: *Centella asiatica Linn.*
Family: *Apiaceae*

***Ayurvedic* properties Description**[29]

Rasa: *Tikta (Kashaya Anurasa)*
Guna: *Laghu*
Virya: *Sheet*
Vipaka: *Madhur*
Prabhav: *Medhya*

In *Bhavprakash Samhita, Mandukparni* is said to be possessing *Tikta, Kashaya* and *Madhur Rasa, Laghu guna, Madhur Vipaka* and *Medhya*[30]. In *Nighantu Adrash, Mandukparni* is described as possessing *Tikta, Kashaya* and *Madhur Rasa, Sheet Virya, Madhur* and *Katu Vipaka*[31].

Description in *Ayurvedic* Pharmacopoeia of India (API)[32]

Vernacular Names

Sanskrit : Manduki, Darduracchada
Assamese : Manimuni
Bengali : Jholkhuri, Thalkuri, Thankuni
English : Indian Pennywort
Gujrati : Khodabrahmi, Khadbhrammi
Hindi : Brahma Manduki, Brahmi
Kannada : Ondelaga, Brahmi soppu
Malayalam : Kodangal
Marathi : Karivana
Punjabi : Brahmi
Tamil : Vallarai
Telugu : Saraswati Aku, Vauari
Urdu : Brahmi

DESCRIPTION

a) Macroscopic: Small creeping herb with slender stem, rooting at nodes giving rise to thin, brownish-grey, roots of about 2.5 to 6.0 cm in length; leaves 1 to 3 from each node, orbicular-reniform, crenate, base cordate, petioles channeled with adnate stipules; flowers fascicled umbels each carrying 3 or 4 flowers, short stalked; fruits cremocarp, ovoid, with laterally compressed seeds. (Figure 1 - 4)

b) Microscopic

Root - Shows wavy outline, consisting of 3 to 5 layered, rectangular, cork cells having exfoliated cells, followed by 3 or 4 layers of parenchyma cells containing oval to round, simple, starch grains measuring 8 to 16 µ in dia., having centric hilum and microsphenoidal crystals of calcium oxalate; secondary cortex composed of thin-walled, oval to polygonal, parenchymatous cells; secretory cells present, scattered towards periphery region; secondary phloem and secondary xylem consisting of usual elements; vessels lignified with reticulate and spiral thickening; pith nearly obliterated.

Stem - More or less concave-convex outline, shows single layered epidermis composed of round to cubical cells covered by striated cuticle; below this 2 or 3 layers of collenchymatous cells, followed by 6 to 8 layers of thin-walled, isodiametric, parenchymatous cells with intercellular spaces present; vascular bundles collateral, open, arranged in a ring, capped by patches of sclerenchyma and traversed by wide medullary rays; vessels with spiral thickening present, resin duct present in parenchymatous cells of cortex and generally one in between vascular bundles; pith of isodiametric, parenchyma with intercellular spaces.

Leaf-Petiole - shows a characteristic outline due to two projections adjacent to ventral groove; epidermis single layered, cells cubical covered by a thick cuticle; inner walls of epidermal cells adjoining the cortex much thickened; hairs absent; collenchyma 2 or 3 layered, absent on the projections, a broad zone of more or less rounded parenchyma cells present with intercellular spaces, and a few containing rosette crystals of calcium oxalate; resin canal present on dorsal side of each vascular bundle except in the vascular bundles occurring projecting arms; vascular bundles seven in number, two of which less developed and present in projections.

Midrib - show a single layered epidermis, 2 or 3 layered collenchyma on both surfaces, 4 or 5 layered parenchyma, mostly devoid of chloroplasts; central zone occupied by vascular bundles differentiated into xylem towards ventral side and phloem towards dorsal side; phloem consisting of sieve tubes, companion cells and phloem parenchyma; xylem consisting of radial rows of vessels with xylem parenchyma in between.

Lamina -shows an epidermis of tangentially elongated cells on both surfaces, larger on the upper surface, covered by striated cuticle; mesophyll differentiated into 2 or 3 layers of palisade cells, 5 to 7 layers of loosely arranged, somewhat isodiametric spongy parenchyma; rosette crystals of calcium oxalate present in a few cells; stomata more on the lower surface, anisocytic in general, but anomocytic type also occurs on both surfaces, palisade ratio 3 to 5, stomatal index on upper surface, 9 to 12, and lower surface 11 to 17.

Fruit - Shows several ridges in outline; epicarp consists of single layered epidermis covered externally with thick cuticle; mesocarp consists of polygonal, thin walled parenchymatous cells having patches of sclerenchymatous cells on both lateral side; each ridge having a vittae and patch of sclerenchyma; endocarp consists of columnar shaped sclereids arranged in wavy layers; endosperm and embryo composed of oval to polygonal, thin-walled parenchymatous cells.

Powder - Green to greenish-brown, shows fragments of epidermal cells polygonal in surface view with stomata, palisade cells, vessels with spiral, reticulate and annular thickening; microsphenoidal and rosette crystals of calcium oxalate; simple, oval to round starch grains measuring 8 to 16 µ in dia.

Action[33]: Adaptogen, central nervous system relaxant, peripheral vasodilator, sedative, antibiotic, detoxifier, blood-purifier, laxative, diuretic, emmenagogue. Used as a brain tonic for improving memory and for overcoming mental confusion, stress, fatigue, also used for obstinate skin diseases and leprosy. Raw leaves are eaten or plant decoction is drunk to treat hypertension.

Active constituents[34]: The primary active constituents of CA are saponins (also called triterpenoids), include asiaticosides in which a trisaccharide moiety is linked to the aglycone asiatic acid, madecassoside and madasiatic acid. These triterpene saponins and their sapogenins are thought to be mainly responsible for the wound healing and vascular effects by inhibiting the production of collagen at the wound site. Other components isolated from CA, such as brahmoside and brahminoside, which are postulated to be responsible for CNS and uterorelaxant actions, but are yet to be confirmed by clinical studies. Crude extract that contains glycosides isothankuniside and thankuniside showed antifertility action in mice.

In addition, the total extract contains plant sterols, flavonoids, and other components with no known pharmacological activity, namely, abundant tannins (20-25%), essential acid (0.1% with beta-chariophylen, trans-beta-pharnesen and germachrene D), phytosterols

(campesterol, sitosterol, stigmasterol), mucilages, resins, free aminoacids(alanine, serine, aminobutyrate, aspartate, glutamate, lysine and treonine), flavonoids (derivates of chercetin and kempferol), an alkaloid (hydrochotine), a bitter component (vallerine), fat acids (linoleic acids, linolnelic, oleic, palmitic and stearic).

Pharmaceutical properties:

Sedative and anxiolytic properties[35]: CA has been described to possess CNS effects in Indian literature such as stimulatory nerve tonic, rejuvenator, sedative, tranquilizer and intelligence promoting property. It has been traditionally used as a sedative agent in many Eastern cultures, with the effects was postulated mainly due to the brahmoside and brahminoside constituents. On the other hand, the anxiolytic activity, in part was attributed due to it's binding to cholecystokinin receptors.

Antidepressant activity[36]: The antidepressant effect of total triterpenes from CA on the immobility time in forced swimming in mice and concentration of amino acid in mice brain tissue were observed. Later on, the same authors investigated the possible antidepressant effect of total triterpentes of CA by measuring the corticosterone levels in mice brain.

Anti-epileptic effects[37]: Asian CA increases the cerebral levels of γ-amino butyric acid (GABA), which explains its traditional use as anxiolytic and anti-convulsant. It is known that GABA and its agonists inhibit the central cholinergic action by affecting the turnover rate of acetylcholine in the rat brain. The isolated steroids from the plant have been used to treat leprosy. In one study, the effect of *aqueous* extract of CA (100 and 300 mg/kg) was evaluated on the course of kindling development, kindling-induced learning deficit and oxidative stress markers in pentylenetetrazole (PTZ) kindled rats.

Cognition and antioxidant properties[38]: CA is known to re-vitalize the brain and nervous system, increase attention span and concentration and to combat aging. A study demonstrated cognitive enhancing and anti-oxidant properties of CA in normal rats. The effect of an *aqueous* extract of CA (100, 200 and 300 mg/kg for 21 days) was evaluated in intra cerebro ventricular (i.c.v.) streptozotocin (STZ) –induced cognitive impairment and oxidative stress in rats.

Herbal drug interactions

Though, there have been no reports documenting negative interactions between CA and medications to date, the cautions were raised based mainly on the knowledge of mechanism of actions derived from the laboratory studies conducted on animals. Since high doses of CA were found to cause sedation, it was warned that individuals should refrain from taking this herb with medications that promote sleep or reduce anxiety[39].

Theoretically, CA was postulated to interfere with blood glucose levels and thus it was proposed that the hypoglycemic therapy may possibly interfere with cholesterol lowering herbs like CA[40].

Conclusion: There were controversies regarding the authentic identification of the plant but API has put on rest all controversies by establishing its authenticity and described *Mandukparni* as *Centella asiatica*. *Mandukparni* is described among four specific *medhya rasayana* by *acharya Charak* and following him, nearly all *ayurvedic* treatise have described *Mandukparni* as *medhya*. The plant is said to be *Rasayana* by *Samhita* and *Chikitsa granths*. Considering the above facts, the plant has been used in many formulations as both curative and preventive medicine. *Unmaad, Apasmar, Chittodvega* and *Chitbhram sannipatajwara* are among the disorders where the plant is used for its *Medhya* and *Rasayana* property. The drug has been also used in many other disorders including *Kaas, Atisara, Grahani, Prameha, Arsh, Kamla*, *Pandu* etc. Experimental studies performed on animals have shown antidepressant, sedative, anxiolytic and antiepileptic properties of the plant. The drug is well known for its cognitive, nootropic and anti-oxidant effects as discussed earlier. The drug has been researched for its antihypertensive effects and it has been found that the drug is significantly helpful in managing the symptoms of essential hypertension like anxiety, headache, irritability and reduced sleep.

Abbreviations

1. Ch. Su. – Charak Sutrasthan
2. Ch. Vi. – Charak Vimanasthan
3. Ch. Chi. – Charak Chikitsasthan
4. Su. Su. – Sushruta Sutrasthan
5. Su. Chi. – Sushruta Chikitsasthan
6. Su U. – Sushruta Uttartantra
7. A.S.U. – Astang Sangrah Uttartantra
8. A.H.Su. –Astang Hridya Sutrasthan
9. A.H.Chi. – Astang Hridya Chikitsasthan
10. A.H.U. – Astang Hridya Uttartantra
11. Ka. Su. – Kashyapa Samhita Sutrasthan
12. Bha. Chi. – Bhavprakash Chikitsasthan
13. C.D. – Chakradutta
14. Y.R.U. – Yogratnakar Uttarardha
15. B.R. – Bhaisjyaratnavali
16. CA – Centella asiatica
17. API – Ayurvedic Pharmacopoeia of India

REFERENCES

1. *Acharya Agnivesha,* Charak Samhita*,* Vol. II with elaborated Vidyotini Hindi Commentary, Edited by Pt. Kashinatha Shastri and Dr. Gangasahaya Pandey, Published by Chaukhamba Bharati Academy, Varanasi, Edition: 2006, p28.
2. PV Sharma, Dravyaguna vijananam Vol. IV, Chaukhamba Bharti Academy, Reprint 2003, p111.
3. *Acharya Agnivesha,* Charak Samhita*,* Vol. I and II with elaborated Vidyotini Hindi Commentary, Edited by Pt. Kashinatha Shastri and Dr. Gorakhnath Chaturvedi, Published by Chaukhamba Bharati Academy, Varanasi, Edition: 2012.
4. Sushruta Maharsi, Sushruta samhita*,* Vol. I and II Ayurveda-Tatva-Sandipika, Hindi Commentary, Edited by Kaviraja Ambikadutta Shastri, Chaukhamba Sanskrit Sansthan, Edition: 2012.
5. *Acharya* Vagbhata, Astanga Samgraha, Translated by Prof. K.R. Srikantha Murthy, Vol. I to III, Chaukhambha Orientalia, Varanasi, Edition: 2005.
6. *Acharya* Vagbhata, Astanga Hridayam, Translated by Prof. K.R. Srikantha Murthy, Vol. I to III, Chaukhambha Krishanadas Academy: Edition: 2014.

7. Maharishi Maricha Kashyapa, Kasyapa Samhita or Vriddhajivaka Tantra, Edited by Prof. P.V. Tewari, Chaukhambha Visvabharati, Varanasi, Edition: 2002.
8. Sri Bhavmisra, Bhavaprakasa, Edited by Pandit Shri Brahma Shankar Misra. Part II, Chaukhamba Sanskrit Sansthan, Edition: 2005.
9. Chakrapanidatta, Chakradatta, Commentary by Tripathi Indradeva, Edited by Dwivedy Ramanath, Chaukhamba Sanskrit Sansthan, Edition: 2005.
10. Vaidya Laxmipati Sastri, Yogaratnakara, Edited by Brahmasankar Sastri, Chaukhambha Prakashan, Varanasi, Edition: 2010.
11. Kaviraj Govind Das Sen, Bhaisajya Ratnawali, Commentary by Prof. Siddhi Nandan Mishra, Chaukhambha Surbharati Prakashan, Varanashi, Edition: 2007.
12. Sausharuta Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Veertaradi gana
13. Astang Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Veertaradi gana
14. Dhanvantari Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Karveeradi varga
15. Nighantu Shesh, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Shaak kaand
16. Sodhala Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Karveeradi varga
17. Madhav Dravyaguna, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Shaak varga
18. Abhidhana Ratnamala, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Tikta skanda
19. Hridyadeepak Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Chatushpad varga
20. Kaiyadeva Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Aushadhi varga
21. Bhavprakash Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Guruchyadi varga
22. Kailash Pati Pandey & Dr.Anugraha Narain Singh, *Gunaratnamala*, Edition 2005, p289
23. Dr. Indradeva Tripathi, *Raj Nighantu*, Chaukhambha Krishna das Academy, Edition: 2006, p117.
24. Rajvallabha Nighantu, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Madhyahnika parichhed.
25. Priya Vrat Sharma, *Priya Nighantu*, Chaukhambha Subharati Prakashan, Varanasi, Edition: 2004, p.97.
26. Bapalal Vaidya, *Nighantu Adarsha*, Vol. I, Chaukhambha Bharati Academy, Varanasi, Edition: 2002, p.670.
27. Dravyaguna Sangraha, e-Nighantu, Collection of Ayurvedic Lexicons, CCRAS, New Delhi, Edition: 2012, Shaak varga
28. Centella asiatica [homepage on Internet], [cited 2017 March 03] Available from https://www.wikipedia.org/wiki/centella_asiatica
29. PV Sharma, Dravyaguna Vijnanam Vol. II, Chaukhamba Bharti Academy, Reprint: 2003, p3.
30. Prof. KC Chunekar, Bhavaprakash Nighantu, Chaukhamba Bharti Academy, Reprint: 2013, p448
31. Bapalal Vaidya, *Nighantu Adarsha*, Vol. I, Chaukhambha Bharati Academy, Varanasi, Edition: 2009, p670.
32. Ayurvedic Pharmacopoeia of India, Govt. of India, Dept. Of Ayush, Part I Vol. IV, p69-71.
33. CP Khare, Indian Medicinal Plants An Illustrated Dictionary, Springer, ISBN: 978-0-387-70637-5, Edition 2007, p136.
34. Kasmira J. Gohil et. al., Pharmacological Review on *Centella asiatica*: A Potential Herbal Cure, NCBI, PMC3116297
35. Ramaswamy AS, Pariyaswami SM, Basu N. Pharmacological Studies on *Centella asiatica*.Linn. Indian J Med Res. 1970;4:160–4.
36. Chen Y, Han T, Rui Y, Yin M, Qin L, Zheng H. Effects of total triterpenes of *Centella asiatica* on the corticosterone levels in serum and contents of monoamine in depression rat brain. Zhong Yao Cai. 2005;28:492–6, [PubMed]
37. Ganachari MS, Babu V, Katare S. Neuropharmacology of an extract derived from *Centella asiatica*. Pharm Biol. 2004;42:246–52.
38. Veerendra Kumar MH, Gupta YK. Effect of *Centella asiatica* on cognition and oxidative stress in an intracerebroventricular streptozotocin model of Alzheimer's disease in rats. Clin Exp Pharmacol Physiol. 2003;30:336–42. [PubMed]
39. Centella: Monographs for herbal medicinal products. 2007. [consulted on 2008 May 12]. available from: http://www.mohp.gov.eg/Sec/Statistics/hplants.pdf
40. Kartnig T. Clinical applications of *Centella asiatica* (L) urb. In: Craker LE, Simon JE, editors. Herbs, spices, and medicinal plants: Recent advances in botany, horticulture, and pharmacology. Phoenix AZ: Oryx Press; 1986. pp. 145–73.

Cite this article as:
Kumar Naveen, Chaubey Suresh, Singh Sanjay Kumar, Tewari Ramesh Chandra. Comprehensive Literature Review of Mandukparni (Centella asiatica) w.s.r. to its Medicinal Properties. International Journal of Ayurveda and Pharma Research. 2017;5(5):65-71.

Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**
Dr. Naveen Kumar
MD Scholar IIIrd Year
PG Department of Dravyaguna
Rishikul Campus Haridwar, UAU
Email: docdotlucky@gmail.com
Mobile No. – 8222061333

Figure 1. Mature plant of *Centella asiatica* on Herbarium sheet

Figure 2. Leaves of *Centella asiatica*

Figure 3. Mature plant of *Centella asiatica*

Figure 4. Fruiting of *Centella asiatica*