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Pharmacological review of *Charakokta Medhya Rasayana*

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Abstract

Medhya Rasayana is derived from classical text, Charaka Samhita, Chikitsa Sthana, Rasayana Adhyaya, Karaprachitiya Rasayana Pada, effective in improving Medha (Intellectual and cognitive function) and it includes four drugs i.e. Mandukaparni Swarasa, Yashtimadhu with milk, Guduchi Swarasa and Sankhapushpi Kalka. Rasayana therapy enriches life by enhancing the physiological status of the body tissues. Improvement of Medha i.e. intelligence is one of the benefits of Rasayana therapy. In this study a review is done of various research papers, thesis and texts to understand the pharmacological action (in context of Medhya Guna) of Charakokta Medhya Rasayana.

Keywords: charakokta medhya rasayana, mandookparni, yashtimadhu, guduchi, shankpushpi, medha, rasayana

Introduction

In Ayurveda *Rasayana therapy* is explained, which protects the body from *Roga* (Disorders) and maintain healthy condition of the body by formation of best *Dhatu* (elements) in human body. Chakrapani says along with physical excellences, psychic excellences like sharp memory etc. are also endowed of *Rasayana*. Various types of *Rasayanas* are described in ancient Ayurveda texts for specific purposes. *Medhya Rasayana* are group of medicinal plants described in Ayurveda with multifolded benefits, specially to improve memory and intellect by *Prabhava*. The term *Medha* has been used mainly in 2 ways viz. *Grahana shakti* (Grasping power) and *Dharana Shakti* (Retention power). A person is able to obtain the knowledge of existing objects and retain it through *Medha*.

These drugs import mental performance higher Central Nervous System (C.N.S) functions and relieve stress, anxiety and depression.

Literature Review

Charakokta Medhya Rasayana

In the present study *Medhya Rasayana* is derived from classical text, *Charaka Samhita*, *Chikitsa Sthana*, *Rasayana Adhyaya*, *Karaprachitiya Rasayana Pada*, effective in improving *Medha* (Intellectual and cognitive function) and it includes four drugs i.e. *Mandukaparni Swarasa*, *Yashtimadhu* with milk, *Guduchi Swarasa* and *Sankhapushpi Kalka*.

मण्डूकपर्ण्यः स्वरसः प्रयोज्यः क्षीरेणयश्टीमधुकस्य चूर्णम् । रसोगुडूच्यास्तुसमूलपुश्याः कल्कः प्रयोज्यः खलु भांखपुश्याः ॥३०॥

आयुः प्रदान्यामयना । नानिबलाग्निवर्णस्वरवर्धनानि । मेध्यानिचेतानिरसायनानि मेध्या वि । शेषेण च भांखपुशपी ॥३१॥ इति मेध्यरसायनानि । चरक चिकित्सा (2 / 30,31)

1. Mandukaparni

Botanical Name: *Centella asiatica* (L) Urban

Family: Umbelliferae (Apiaceae)

Classification

Charaka: *Tiktakanda, Prajasthapana, Vayahsthapana, Balya*

Sushruta: *Tiktavarga*

Bhavaprakasha: *Guduchyadivarga*

Vernacular names: Sanskrit: *Mandukaparni*

English: Indian Pennywort

Hindi: *Vangsaag, Brahmi, Manduki*

Gujarati: *Khandibrahmi*

Punjabi: *Brahmi*

Synonyms: *Mandukaparni, Manduki, Brahmi, Saraswati*

Parts used: *Panchanga* (whole plant)

Dose: Extract 10-20ml



Fig 1: Mandookparni

Table 1: Pharmacodynamic Properties of *Mandukaparni* according to various texts

S.N.	Bhava	Dhanvantari Nighantu	Kaiyadeva Nighantu	Bhavaprakasha	Raja Nighantu
1	Rasa	Tikta, Kashaya	Tikta, Kashaya, Madhura	Tikta, Kashaya, Madhura	Kashaya, Tikta
2	Guna	Sheeta, Laghu	Sheeta, Laghu	Sheeta, Laghu	Lagu
3	Vipaka	-	Madhura	Madhura	Madhura
4	Veerya	Sheeta	Sheeta	Sheeta	Sheeta
5	Dosha Karma	VK↓	K↓	K↓	VP↓

Chief Characters

- Stolon herb with long creeping stems rooting at the nodes.
- Leaves long petioled, rounded, with toothed margins (*Mandukaparni*-Frog claw like).
- Flowers minute, pinkish-red, 3-6 in clustered umbel.
- Fruit 8 mm long, like grain of barley, 7-9 ridged, brown, dull, oblong, 2-seeded.

Therapeutic Uses

Intellect promoting, nervine tonic, promote longevity, and preserves youth. In China, *Centella asiatica* is reported as "Miracle elixirs of life". *Centella asiatica* is also considered as "FOOD FOR THE BRAIN". It is said to combat stress and depression, energize flagging mental powers, wards off a nervous breakdown and improve reflexes. It stimulates the CNS, rebuilds energy reserves, relieves high B.P. and helps the body defend against various toxins. It has positive action on the circulatory system [Ref: Garef Times, June – July – 2002]. Brahmi acts as an enzyme activator, which converts inactive precursor of an active enzyme to the active form. It transfers high energy in the brain cells, which are concerned with attention of long-term memory. [Ref.: Ayurwave, August-2002]. Fresh whole plant juice is used for therapeutic purposes as Medhya (cognitive enhancer) [1]. They act on behaviour besides being neuro-protective [2]. and brain growth promoter [3]. Dendritic arborization is supposed to be the neuronal basis for improved learning and memory [4]. Anti-seizure activity may result from direct or indirect modulation of ATPase activity [5]. *Centella asiatica* inhibits the memory impairment induced by scopolamine through the inhibition of AChE. Methanol extract of *Centella asiatica* (*C. asiatica*) showed highest free radical scavenging activity that can be attributed to the presence of polyphenols and flavonoids as this fraction contains maximum amount of these secondary metabolites (0.07 mg/ml). It also exhibited DNA damage protection activity on pRSETA plasmid DNA in TE buffer (10 mM Tris-Cl and 1 mM EDTA) pH 8.0. Chloroform extract of *Centella* showed highest poly phenolic activity followed by methanol extracts (9.04 µg/mg, 7.7 µg/mg, 6.76 µg/mg Gallic acid equivalents respectively); while flavonoids were abundant in water extracts, followed

by chloroform extracts. These two namely poly phenols and flavonoids are responsible for potent anti-oxidant and terminate free radicals [6]. Rats treated with *C. asiatica* in another study showed a dose dependent increase in both cognitive and behaviour paradigms. A significant decrease in MDA and an increase in glutathione and catalase levels were observed only in rats treated with 200 and 300 mg/kg *C. asiatica*. The results indicated that an aqueous extract of *C. asiatica* is effective in preventing the cognitive deficits, as well as oxidative stress, caused by i.c.v. STZ in rats [7]. The rat pups (7-days-old) were fed with 2, 4 and 6 ml/kg body of fresh leaf juice of CeA for 2, 4 and 6 weeks showed significant increase in dendritic length (intersections) and dendritic branching points along the length of dendrites of the amygdaloid neurons of rats treated with 4 and 6 ml/kg body weight/day of CeA for longer periods of time (i.e. 4 and 6 weeks). The study indicated that constituents/active principles present in CeA fresh leaf juice has neuronal dendritic growth stimulating property; hence it can be used for enhancing neuronal dendrites in stress and other neurodegenerative and memory disorders [8].

Actions: *Medhya, Hridya, Stambhana, Shothanashaka, Mutrala, Shodhaka, Kushthagha, Balya, Rasayana*

Chemical Constituents: Glucosides, brahmoside and brahminoside, centelloride and triterpenicacides, centoic and along with centallic acids, Sapogenins, flavonoid, madecassoside and asiaticoside isolated from plant

Habitat: Throughout India in marshy places upto 6000 feet.

Yashtimadhu

Botanical Name: *Glycyrrhiza glabra* Linn.

Family: Leguminosae

Classification: Charaka: *Kanthy, Jeevaniya, Sandhaniya, Varnya, Kandughna, Mutraviranjaniya, Shonitasthapana.*

Sushruta: *Kakolyadi, Sarivadi, Anjanadi*

Bhavaprakasha: *Haritakyadi Varga*

Vernacular names: English: Liquorice

Hindi: *Jethimadhu, Mulethi*

Gujarati: *Jetimadh*

Punjabi: *Mulethi*

Synonyms: *Madhuka, Kleetaka, Atimadhura*

Parts used: Root

Table 2: Pharmacodynamic Properties of *Yashtimadhu* according to various texts

SN	Bhava	Dhanvantari Nighantu	Kaiyadeva Nighantu	Bhava-prakasha	Raja Nighantu	Shaligram Nighantu	Nighantu Adarsh
1	Rasa	Madhura	Madhura	Madhura, Tikta	Madhura, Tikta	Madhura	Madhura, Tikta
2	Guna	-	Guru, Snigdha	Guru	-	-	-
3	Vipaka	-	-	Madhura	-	-	-
4	Veerya	Sheeta	Sheeta	Sheeta	Sheeta	Sheeta	-
5	Dosha Karma	P↓	VPK↓	VP↓	P↓	-	-

Chief Characters

- A perennial herb 60-120 cm height
- Leaves opposite and pinnate, 4-7 pairs.

- Flowers pinkish or violet in racemes.

- Pods oblong, linear.

5. Roots pale brown externally and light-yellow colour internally and fibrous.

Therapeutic Uses

Multidimensional activities of *Yashtimadhu* may be attributed to glycyrrhizine and flavonones. The roots and rhizomes of *G. glabra* has been studied with respect to spatial learning and passive avoidance [9] preliminary free radical scavenging [10]. and antioxidant capacity towards LDL oxidation [11]. Glycyrrhiza *glabra* aqueous extract markedly improves antihypoxic effects induced by sodium nitrite in rats and this effect may be mediated by its antioxidant properties [12, 13]. The roots and rhizomes of *Glycyrrhiza glabra* is an efficient brain tonic; it increases the circulation into the CNS system and balance the sugar levels in the blood [14]. Liquorice has significant action on memory enhancing activity in dementia [15]. It significantly improved learning and memory on scopolamine induced dementia. Oral glabridin administration (25 and 50 mg/kg) improved learning and memory in non-diabetic rats, it also reversed learning and memory deficits of diabetic rats. The study concluded that glabridin prevented the deleterious effects of diabetes on learning and memory in rats by combination of antioxidant, neuroprotective and anticholinesterase properties [16]. The higher doses (2 and 4 mg/kg; p.o.) of glabridin and piracetam significantly antagonized the amnesia induced by scopolamine (0.5 mg/kg; i.p.) in an experimental model. Furthermore, both glabridin (2 and 4 mg/kg; p.o.) and metrifonate (50 mg/kg; i.p.), used as a standard drug, remarkably reduced the brain cholinesterase activity in mice compared to the control group [17].

Actions: *Vatta-Pittashmaka, Dahashamaka, Keshya, Medhya, Vedanasthapana, Shothahara, Chhardigrahana, Vatanulomana, Mriduvirechana, Shonitasthapana, Kaphanissaraka, Kanthya, Mutrala, Shukravardhaka, Varnya, Kandughna, Jwarashamaka, Jeevaniya, Sandhaniya, Rasayana and Balya*

Parts Used: Roots

Dose: Powder 4-6gm; Decoction 50-100ml.

Preparations: *YashtyadyaChurna, -kwatha and -taila, Chyawanaprasha.*

Chemical Constituents: Glycyrrhizine, glycyrrhizic and glycyrrhizic acids.

Habitat: Cultivated in Punjab and Sub-Himalayan tracts.

2. Guduchi

Botanical name: *Tinosporacordifolia* (Willd) Miers.

Family: Menispermaceae

Classification

Charaka: *Vayasthapana, Dahaprashamana, Trishnanigrahana, Triptighna, Stanyashodhana,*

Sushruta: *Guduchyadi, Patoladi, Aragvadhadi, Kakolyadi, Valli panchamula*

Bhavaprakasha: *Guduchyadivarga*

Vernacular names

Sanskrit Name: *Guduchi*

English: *Tinospora*

Hindi: *Giloy, Gujarati: Galo, Punjabi: Giloy*

Synonyms: *Madhuparni, Amruta, Chhinnaruha, Tantrika, Vatsadani, Kundalani, Chakralakshanika, Varshabhu*

Parts used: *Kanda* (stem)

Table 3: Pharmacodynamic Properties of *Guduchi* according to various texts

SN	Bhava	Charaka Samhita	Sushruta Samhita	Dhanvantari Nighantu	Kaiyadeva Nighantu	Bhava prakasha	Raja Nighantu	Dravya guna Vigyan
1	Rasa	Tikta	Tikta	Tikta, Kashaya	Tikta, Kashaya, Katu	Katu, Tikta, Kashaya	Tikta, Kashaya	Tikta, Kashaya
2	Guna	Guru	-	Guru	Laghu	Laghu	Guru	Guru, Snigdha
3	Vipaka	Madhura	-	-	Madhura	Madhura	-	Madhura
4	Veerya	Ushna	-	Ushna	Ushna	Ushna	Ushna	Ushna
5	Dosha Karma	V ↓	PK ↓	VPK ↓	VPK ↓	VPK ↓	VPK ↓	VPK ↓

Chief Characters:

1. A large, glabrous, deciduous climbing shrub, bark grey brown or greenish white with long aerial roots.
2. Leaves base deeply cordate, onate.
3. Flowers small, yellow, unisexual.
4. Fruit pea shaped drupe and red.

Chemical Constituents: Alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides [18].

Therapeutic Uses: Juice of whole plant is used therapeutically as *Medhya* [19]. It is also used in the form of decoction, powder and *Satva* (starch extract of stem). In one study the anti-stress and tonic property of the plant was clinically tested and it was found that it brought about good response in children with moderate degree of behaviour disorders and mental deficit. It has also significantly improved the I.Q. levels. The neuroprotective and neuroregenerative potential of *Tinospora cordifolia* was found against glutamate-induced excitotoxicity using primary cerebellar neuronal cultures as a model system. Butanol extract of *T. cordifolia* (B-TCE) exhibited neuroprotective potential by

preventing degeneration of neurons induced by glutamate [20]. Neuroprotective and ameliorative properties are due to their antioxidant and trace element contents [21]. *Tinospora cordifolia* is known to be a rich source of trace elements (Zinc and Copper) which act as antioxidants and protects cells from the damaging effects of oxygen radicals generated during immune activation [22]. It increases the blood profile and has lead scavenging activity [23]. *Tinospora cordifolia* has been claimed to possess learning and memory enhancing [24], antioxidant [25, 26], and anti-stress activity [27]. *Tinospora cordifolia* enhanced the cognition in normal and cognition deficits animals. Mechanism of cognitive enhancement is by immune-stimulation and increasing the synthesis of acetylcholine, this supplementation of choline enhances the cognition [28]. Myriad actions of *Guduchi* may be attributed to its antioxidant [29, 30] and immune-modulatory properties [31]. Administration of aqueous and alcoholic extracts of *Tc* (100 and 200 mg/kg respectively) for 15 days in an experimental model enhanced cognition (learning and memory) in normal rats and rats with cyclosporine induced memory deficit. It also provided hippocampal protection in normal rats as against cyclosporine

treated rats showed neurodegenerative changes on histopathological study [32]. Oral administration of *Tinospora cordifolia* (500 mg aqueous extract) for 30 healthy volunteers (age 18-30 years) in a double blind, randomized and placebo controlled design enhanced verbal learning and memory and logical memory (of immediate and short term type) [33], also showed significant antidepressant activity by increasing brain monoamines [34]. The most likely antidepressant mechanisms involve inhibiting reuptake of mines in the brain, improved levels of norepinephrine (NE), serotonin (5hydroxytryptamine or 5HT), and dopamine (DA), and decreased levels of gamma aminobutyric acid (GABA) [35].

3. Shankhapushpi

Latin name: *Convolvulus pluricaulis* chosiy.

Family: Convolvulaceae.

Classification

Bhavaprakasha: *GuduchyadiVarga*

Vernacular names

English: Bind weed

Sanskrit: *Shankhpushpi*

Hindi: *Shankhahuli*.

Gujarati: *Shankhavali*

Punjabi: *Shankhapushpi*

Synonyms: *Kshirapushpi, Mangalyakusuma*

Parts used: *Panchanga* (entire plant)



Fig 2: *Shankhpushpi*

Table 4: Pharmacodynamic Properties of Shankhapushpi according to various texts

SN	Bhava	Dhanvantari Nighantu	Kaiya.Nigha.	Bhava-prakash	Raja Nigha.	Shali. Nighantu	Nigh. Adarsh	Dravy. Vigyan
1	Rasa	Katu, Tikta	Katu, Tikta	Kashaya	Tikta	Kashaya, Katu	Katu, Tikta	Kashaya, Katu, Tikta
2	Guna	-	Sara	Sara, Picchila	-	Tikshna, Sara	-	Snigdha, Guru, Sara
3	Vipaka	Katu	-	-	-	Katu	-	Madhura
4	Veerya	Ushna	Unushna	Ushna	Sheeta	Ushna	Ushna	Sheeta
5	Dosha Karma	-	-	-	VPK↓	P↓	-	VPK↓

Chief Characters

1. A prostrate or sub-erect, spreading, hairy, perennial herb with a woody root stock.
2. Leaves shortly petioled, linear-lanceolate, the upper smaller, hairy on both sides.
3. Flowers white or pale-rose, solitary or in pairs.
4. Fruit capsule oblong-glabose, pale-brown, seeds minutely puberulous.

Therapeutic Uses: It is a psychostimulant and tranquilizer. Dietary feeding of this plant has been found to increase protein synthesis in the hippocampus, thus enhancing memory and learning in experimental animals. The plant is mainly used as a *Rasayana*, which is advocated for use in rejuvenation therapy. *C. pluricaulis* has been found to augment both cognitive function and memory-enhancing effects in many behavioral studies. Studies have also showed that the ethanolic plant extract of *C. pluricaulis* (CP) reduced the increased levels of malondialdehyde (MDA) and protein carbonyl. Studies have shown beneficial effect of extract on decreased glutathione peroxidase (GPx) and reduced glutathione (GSH) in hippocampus.

Important Neuro-protective and intellect promoting activity implicated to free radical scavenging and antioxidant property [36]. BR-16A (Mentat), a poly herbal combination containing *Shankhapushpi* significantly reversed the social isolation stress-induced prolongation of onset and decrease in pentobarbitone-induced sleep, increased total motor activity and stress-induced antinociception in experimental model [37]. Ayushman-8 (containing *Shankhpushpi*, Brahmi and Vacha) reported to be effective on *Manasa-mandata* (mental retardation) [38].

Shankhapushpi compound containing *Shankhapushpi*, *Sarpagandha*, and *Gokshura* in equal quantities studied to be effective in *Chittodvega* (anxiety disorders) [39]. Sanjay Parsania [40]. reported *Shankhapushpi* to be effective in relieving signs and symptoms of *Chittodvega* (anxiety disorders). Herbalists believe that *Shankhpushpi* calms the nerves by regulating the body's production of the stress hormones, adrenaline and cortisol [41]. In an experimental study, a dose dependent enhancement of memory was observed with *Convolvulus pluricaulis* and *Asparagus racemosus*. Hippocampal regions associated with the learning and memory functions showed dose dependent increase in AChE activity in CA1 with AS and CA3 area with CP treatment. The underlying mechanism of these actions of CP and AE may be attributed to their antioxidant, neuro-protective and cholinergic properties [42]. Daily administration of CP (150 mg/kg) for 3 months along with aluminium chloride (50 mg/kg) decreased the elevated enzymatic activity of acetylcholine esterase and also inhibited the decline in Na⁺/K⁺-ATPase activity aluminium intake. Besides, preventing accumulation of lipid and protein damage, changes in the levels of endogenous antioxidant enzymes associated with aluminium administration were also improved. Oral administration of CP preserved the mRNA levels of muscarinic receptor 1 (M1 receptor), choline acetyl transferase (ChAT) and Nerve Growth Factor- Tyrosine kinase A receptor (NGF-TrkA). It also ameliorated the up regulated protein expression of cyclin dependent kinase5 (Cdk5) induced by aluminium. The potential of CPE to inhibit aluminium induced toxicity was compared with rivastigmine tartrate (1 mg/kg), which was taken as standard. The potential of the extract to

prevent aluminium-induced neurotoxicity was also reflected at the microscopic level, which indicated its neuro-protective effects [43]. Oral administration of CP extract (150 mg/kg) to scopolamine treated rats reduced the increased protein and mRNA levels of tau and AβPP levels followed by reduction in Aβ levels compared with scopolamine treated group [44].

Actions: *Tridoshahara, Medhya, Mastishkashamaka, Nadibalya, Deepana, Pachana, Anulomana, Saraka, Hridya, Jwaraghna, Dahaprashamana, Prajasthapana, Rasayana, Balya.*

Parts Used: Whole plant

Dose: Extract 20-40ml, Powder 3-6gm.

Preparations: *Shankhapushpi Panaka, AmritadiRasayana, SaraswataChurna*

Chemical Constituents: Convolvulin, resin

Habitat: A common weed found throughout India.

Discussion

Nootropic w.s.r. *Medhya Rasayana* by definition are cognitive enhancers, but a cognitive enhancer is not necessarily a nootropic. A nootropic is a cognitive enhancer that is neuroprotective or extremely nontoxic.

Cognition enhancers are medications and natural supplements that are used to improve the function of various human cognitive abilities such as cognition, memory, intelligence, motivation, attention and concentration when they have become impaired in some manner

- Cognitive enhancement can involve various mechanisms such as:
- Increasing circulation to the brain.
- Providing precursors to neurotransmitters (chemical messengers in the brain).
- Providing usable energy to the brain.
- Improving neuron function.
- Preventing free radical and oxidative damage to brain cells and others [1].

1. Cholinergics: They affect the neurotransmitter acetylcholine or the components of the nervous system that use Acetylcholine which is a facilitator of memory formation. Cognitive functions in the brain are improved by increasing the availability of this neurotransmitter
2. GABA Blockers: They inversely agonize the GABAA α5 receptor site and display memory improvements.
3. Glutamate Activators: The significant memory improvement and possible alertness enhancement has been seen when AMPA transmitter and the AMPA receptors are agonized
4. cAMP: Cyclic adenosine monophosphate is a secondary messenger that, if increased, shows memory improvements. This is done by decreasing the activity of phosphodiesterase-4 (an enzyme that breaks down cAMP).
5. Others: The prefrontal cortex and the locus coeruleus are concentrated heavily with α2A receptors. They have the potential to improve attention abilities via modulating post-synaptic α2A receptors in the prefrontal cortex.
6. Serotonergics: These substances work by affecting the neurotransmitter serotonin or the components of the nervous system that use serotonin.
7. Anti-depression, Adaptogenic (Antistress) and Mood stabilization agents: Stress, depression, and depressed mood

negatively affect cognitive performance. Thus, counteracting and preventing depression and stress may be an effective cognition strategy. Examples- Anxiolytics: Beta blockers, Adafenoxate, Valerian, Butea frondosa, Gotu Kola GABA transaminase inhibitors: Lemon balm MAOI: Passion flower, Rhodiola rosea SSRI: St John’s Wort Adaptogens: Siberian Ginseng, Tea, Foti Anti-inflammatory: Sutherlandia frutescens .

8. Dopaminergics: These substances affect the neurotransmitter dopamine or the components of the nervous system that use Dopamine. Attributable effects of Dopamine are enhancement of attention, alertness and antioxidant activity [45].
9. Amino acids and Proteins Adult brains use amino acids, which are typically found in protein rich food, for the production of enzymes that transport molecules, structural material and neurotransmitters, along with other essential molecules. Eating high protein but low calorie meals increases alertness and attentiveness, although too much protein can have a negative effect as well [12]. Some of the amino acids found beneficial in cognitive enhancement include-L-carnitine, L-cysteine, L-glutamine, L-phenylalanine, L-tryptophan, L-tyrosine
10. Antioxidants They have been found to be very beneficial to brain functioning in many ways. The most common effect of antioxidants on the brain is their protection against oxidative damage. Vegetables (leafy green or cruciferous vegetables), most likely due to their vitamin-E, folate and antioxidant content, help people to retain their mental abilities longer, keeping their brain younger [46].

A review on selected *Charakokta Medhya Rasayana* established their potential to improve cognitive function and *Medha*. The herbs reviewed were *Mandukaparni, Yastimadhu, Guduchi and Shankhapushpi*, showed anti-oxidant and neuro-protective activities. Apart from anti-oxidant activity other factors that aid in cognitive enhancer and neuro protection are acetylcholine esterase inhibition, NMDA antagonism, Dopaminergic activity, removal of amyloid plaques, inhibition of Tau aggregation, Folic acid, glutamic acid, Vitamin B etc. Rasayana herbs presenting with inhibition of AChE activity are *Manduka parni, Yashtimadhu and Guduchi*. Dopaminergic activity is seen in *Guduchi*. Reduction in amyloid plaques and Tau aggregation is characteristic to *Shankhapushpi, Guduchi and Mandukaparni*. Thus these *Rasayana* herbs act by more than one way to break down the pathological path way in age related cognitive decline and hence can be potential contender in cognitive disorders. More over, *Rasayana* drugs enhance digestion, tissue metabolism, nutritional quality of plasma (rasa) and micro circulation. Getting deep into characteristics of drugs it may be postulated that early usage of *Mandukaparni* and *Shankapushpi* as single herb or in combination are beneficial in neuro degenerative condition. *Guduchi* and *Yastimadhu* are helpful in vascular abnormality cognitive disorders. *Yastimadhu* and *Guduchi* are favourable in cognitive disorders due to toxic pathology like aluminium toxicity and food toxicity. *Guduchi* and *Yastimadhu* are useful in cognitive disorders associated with anxiety, depression and personality changes.

Table 5: Comparative study table of *Medhya Rasayana* Syrup

Drug	Guna	Vipaka	Veerya	Prabhava	Doshaghnata
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Mandukparni	Sheeta, Laghu	Madhura	Sheeta	Medhya	VP↓
Yashtimadhu	Guru	Madhura	Sheeta	Medhya	VPK↓
Guduchi	Laghu	Madhura	Ushna	Medhya	VPK ↓
Shankhapushpi	Sara, Picchila	-	Ushna	Medhya	VPK↓

Mandukaparni, *Yashtimadhu*, *Guduchi* and *Shankhapushpi* as they are having *Medhya* (brain tonic) and *Rasayana* (improving and boosting all systems of body) properties.

Dalhana has nicely described the function of *Sadhaka Pitta* in perceiving the things clearly by *Mana* by dispelling the *Kapha* and *Tama*. Site of *Tarpaka Kapha* is brain and it provides nutrition to the neurotransmitters. Brain is the site of *Indriyas* and *Indriyas* are controlled by *Vayu*. Thus brain is also the site of *Vata* (*Prana* and *Vyana Vayu*).

The normal functioning of *Medha* mainly depends on *Pitta Dosh*. *Pitta* in its normal state is *Katu Rasatmak* and related with *Satva Guna* of *Manas*. *Medhya Rasayana Dravya* being *Katu-Tikta Rasatmaka* and *Madhura Vipaki* and *Sheeta Veerya* except *Guduchi* purifies the *Pitta Dosh* and enhances *Satva Guna* by removing *Tamas*. *Tikta Rasa* has been described as *Medhya* by *Vagbhatacharya*. The *Ushna Guna* of *Guduchi* brings about *Pachana* of *Aama* and increases the *Jatharagni*, *Bhootagni* and *Dhatvagni*. The *Madhura Vipaki* and *Sheeta Veerya Dravyas* can help the function of *Tarpaka Kapha* to go on smoothly owing to its constitution that is favourable for *Kapha Karma*. *Dhriti* i.e. *Dharana Shakti*, memory retention capacity which can occur in presence of only *Sheeta Veerya* ⁴⁷. Thus, we see that *Charakokta Medhya Rasayana* are powerful *nootropic drugs* and *cognitive enhancers*.

Conclusion

Ample of evidences through experimental and pre-clinical studies have proven the efficacy of *Charakokta Medhya Rasayana* in improving cognitive functions. *Cognitive enhancers* can help keep one's brain working properly. *Mental awareness*, *concentration*, *quickness*, *intelligence* and more can all be improved by the use of these drugs. In spite of their effective clinical use through ages valid document is sparse.

The need of hour is to study the molecular basis of these herbs in humans.

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