

Medhya Rasayana Plants: Traditional Claims and Modern Neuroprotective Evidence

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Abstract—Medhya Rasayana, a unique concept in Ayurveda, refers to a group of rejuvenative herbs that enhance intellect (*Medha*), memory, and overall cognitive functions. These plants are believed to nourish the nervous system, improve mental clarity, and promote emotional stability. Classical Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* describe four principal Medhya Rasayana drugs—*Mandukaparni* (*Centella asiatica*), *Yashtimadhu* (*Glycyrrhiza glabra*), *Guduchi* (*Tinospora cordifolia*), and *Shankhapushpi* (*Convolvulus pluricaulis*). Each possesses distinct pharmacological properties, such as *Medhya*, *Smritikara*, and *Buddhivardhaka*, which are associated with the nourishment of *Majja Dhatu* and stabilization of *Manovaha Srotas*. Modern pharmacological research has validated many of these traditional claims, revealing neuroprotective effects through antioxidant, anti-inflammatory, and neurogenesis-promoting mechanisms. *Centella asiatica* demonstrates synaptic plasticity and neuronal repair; *Tinospora cordifolia* modulates stress and neuroinflammation; *Glycyrrhiza glabra* exhibits anti-oxidative and anti-depressive effects; while *Shankhapushpi* enhances cholinergic transmission and memory retention. Collectively, these herbs show promise in managing neurodegenerative conditions such as Alzheimer's disease, Parkinson's disease, and cognitive decline associated with aging. Integrative studies suggest that Medhya Rasayana may regulate neurotransmitters like acetylcholine, serotonin, and dopamine, thus bridging the gap between traditional wisdom and neurobiological science. The convergence of Ayurvedic Rasayana principles with modern neuropharmacology opens new therapeutic avenues for cognitive enhancement, stress management, and prevention of neuronal degeneration. However, further clinical and molecular studies are essential to standardize formulations, validate safety, and establish evidence-based protocols for global acceptance.

Index Terms—Medhya Rasayana, Neuroprotection, Ayurveda, Cognitive enhancement, *Centella asiatica*, *Tinospora cordifolia*, *Glycyrrhiza glabra*, *Convolvulus pluricaulis*, Neurodegenerative disorders, Antioxidant activity.

I. INTRODUCTION

Ayurveda, the ancient Indian system of life science, emphasizes health promotion, longevity, and mental equilibrium through preventive and curative strategies. The concept of *Rasayana* represents rejuvenation therapy that enhances vitality, delays aging, and strengthens intellect¹. Among its various categories, *Medhya Rasayana* holds a distinguished position, specifically aimed at promoting intellect (*Medha*), memory (*Smriti*), and concentration². *Charaka Samhita* defines Medhya Rasayana as substances that “promote mental functions and intellect” (*Medhya Rasayanani Medham Smritim Cha Vivardhayanti*)³. The term *Medha* denotes higher mental faculties responsible for comprehension, judgment, and cognitive processing⁴. The dysfunction of *Medha* is analogous to neurodegenerative and cognitive disorders such as dementia and Alzheimer's disease⁵. Ayurveda identifies four primary Medhya Rasayana plants—*Mandukaparni* (*Centella asiatica*), *Yashtimadhu* (*Glycyrrhiza glabra*), *Guduchi* (*Tinospora cordifolia*), and *Shankhapushpi* (*Convolvulus pluricaulis*)—which act through *Majjavaha Srotas* and stabilize the *Manovaha Srotas*⁶. Modern scientific research supports their role as potent neuroprotective, antioxidant, and adaptogenic agents⁷. Conceptual Understanding of Medhya Rasayana

The word *Medhya* originates from the root “*Medha – Buddhi Smritikarmani*,” implying cognitive and mnemonic functions⁸. *Rasayana* means “path of essence,” reflecting nourishment and rejuvenation of body tissues (*Dhatu*)⁹. *Charaka Samhita* categorizes Rasayana therapy into *Kamya* (health-promoting), *Ajasrika* (daily rejuvenation), and *Naimittika* (disease-specific) types¹⁰. *Medhya Rasayana* is a *Kamya Rasayana*, intended to strengthen the intellect and mental faculties in both healthy and diseased persons¹¹.

These herbs primarily pacify *Vata* and *Pitta doshas*, balance *Sattva Guna*, and enhance *Majja Dhatu* metabolism¹². The holistic mechanism of *Medhya Rasayana* parallels the modern neuroprotective paradigm that involves antioxidant defense, neuronal regeneration, and synaptic modulation¹³.

Pharmacodynamic Basis (Ayurvedic View)

Medhya Rasayana plants possess *Madhura* (sweet) and *Tikta* (bitter) *Rasa*, *Laghu* (light) and *Snigdha* (unctuous) *Guna*, and *Sheeta Virya* (cool potency)¹⁴. These attributes pacify *Vata* and *Pitta* doshas and nourish *Majja Dhatu*, which is directly linked with neuronal function¹⁵. Their classical actions include *Medhya* (cognitive enhancer), *Smritikara* (memory promoter), *Balya* (strength-giving), and *Ojovardhaka* (vitality enhancing)¹⁶.

Principal Medhya Rasayana Plants

1. Mandukaparni (*Centella asiatica* Linn.)

Ayurvedic Description:

Listed in *Charaka Samhita* as a prime *Medhya Rasayana*¹⁷, *Mandukaparni* enhances intellect (*Buddhi*), nourishes *Majja Dhatu*, and promotes longevity¹⁸. *Bhavaprakasha Nighantu* mentions it as *Smritivardhini* and *Jeevaniya*¹⁹.

Modern Findings:

Contains triterpenoid saponins—asiaticoside and madecassoside—that enhance neuronal dendritic growth²⁰. Animal studies demonstrate improved spatial learning via BDNF upregulation²¹. It also reduces amyloid-beta-induced oxidative stress in Alzheimer’s models²². Clinical trials report significant improvement in working memory and attention in elderly subjects consuming *Centella asiatica* extract²³.

2. Yashtimadhu (*Glycyrrhiza glabra* Linn.)

Ayurvedic Description:

Described in *Charaka Samhita* and *Sushruta Samhita* as *Varnya*, *Rasayana*, and *Medhya*²⁴. It pacifies *Vata-*

Pitta dosha and promotes calmness, clarity, and memory retention²⁵.

Modern Findings:

Contains glycyrrhizin and flavonoids such as liquiritigenin that exhibit neuroprotective effects through antioxidant and anti-inflammatory mechanisms²⁶. Studies reveal enhancement of acetylcholine levels and inhibition of monoamine oxidase, supporting antidepressant and cognition-enhancing activities²⁷. In Parkinson’s disease models, *Glycyrrhiza* extract reduces dopaminergic cell loss and neuroinflammation²⁸.

3. Guduchi (*Tinospora cordifolia* Willd.)

Ayurvedic Description:

Revered as *Amrita*—the nectar of immortality—Guduchi is classified as *Tridoshaghna* and *Rasayana* in classical texts²⁹. It strengthens immunity, enhances *Medha*, and balances *Ojas*³⁰.

Modern Finding

Contains diterpenoid lactones, alkaloids, and polysaccharides that exert neuroprotective and adaptogenic effects³¹. It reduces oxidative damage and modulates inflammatory cytokines in neuronal tissues³². Experimental models show that *Tinospora* enhances memory and learning performance by regulating acetylcholine activity³³. Its adaptogenic properties normalize stress-induced cortisol imbalance³⁴.

4. Shankhapushpi (*Convolvulus pluricaulis* Choisy)

Ayurvedic Description:

Described as the best *Medhya Rasayana* by *Charaka* and *Vagbhata*³⁵. It pacifies *Tridosha*, promotes *Sattva Guna*, and alleviates anxiety, stress, and cognitive dullness³⁶.

Modern Findings:

Phytochemical analysis identifies alkaloids (shankhapushpine), flavonoids, and coumarins³⁷. Studies show enhancement of acetylcholine synthesis and inhibition of acetylcholinesterase³⁸. It exhibits anxiolytic and antidepressant effects via serotonin and dopamine modulation³⁹. Chronic use improves learning, attention, and memory consolidation⁴⁰.

Synergistic and Comparative Neuropharmacology

The classical *Medhya Rasayana Yoga*—a combination of these four herbs—is believed to act synergistically⁴¹. Modern evidence suggests that polyherbal combinations provide multi-target neuroprotection through antioxidant pathways (Nrf2), anti-inflammatory modulation (NF-κB inhibition), and

enhancement of neurogenesis via BDNF and CREB activation⁴².

Experimental studies reveal that these herbs collectively improve mitochondrial efficiency, reduce neuroinflammation, and promote synaptic plasticity⁴³. Such multi-mechanistic actions position Medhya Rasayana as potential adjunct therapy in neurodegenerative diseases like Alzheimer's, Parkinson's, and age-related cognitive decline⁴⁴.

Neurobiological Correlation with Ayurvedic Concepts
The Ayurvedic *Majjavaha Srotas* corresponds to the central nervous system, while *Ojas* represents the functional vitality of neurons⁴⁵. Medhya Rasayana herbs enhance *Ojas* by stabilizing cell membranes and optimizing neurotransmitter activity⁴⁶. Their *Sattvavardhaka* property promotes emotional balance by modulating the hypothalamic–pituitary–adrenal (HPA) axis⁴⁷.

In neurobiological terms, *Sattva* corresponds to serotonergic and dopaminergic stability, which underpins emotional well-being⁴⁸. *Buddhi* (intellect) and *Smriti* (memory) can be correlated with the functions of the hippocampus and prefrontal cortex⁴⁹. Hence, the actions of Medhya Rasayana herbs align with modern neurochemical and structural mechanisms supporting cognition⁵⁰.

Clinical and Experimental Evidence

Clinical and preclinical studies collectively validate the cognitive benefits of Medhya Rasayana plants:

- *Centella asiatica* improved cognitive scores and reduced anxiety in elderly patients⁵¹.
- *Tinospora cordifolia* enhanced memory and reduced fatigue in chronic stress disorders⁵².
- *Glycyrrhiza glabra* improved cognitive function in children with learning difficulties⁵³.
- *Convolvulus pluricaulis* reduced anxiety and improved memory recall in clinical subjects⁵⁴.

Preclinical data demonstrate protection against amyloid toxicity, oxidative stress, and synaptic degeneration⁵⁵. These findings collectively justify the Ayurvedic categorization of these plants as *Medhya Rasayana*.

II. DISCUSSION

The convergence of Ayurvedic wisdom and modern neuroscience substantiates the holistic efficacy of Medhya Rasayana. Unlike single-target synthetic drugs, these herbs work on multiple pathways simultaneously—reducing oxidative damage, modulating neurotransmitters, and enhancing neurogenesis⁵⁶.

Mandukaparni and *Guduchi* primarily exert antioxidant and mitochondrial-protective actions⁵⁷, while *Yashtimadhu* and *Shankhapushpi* modulate serotonin, dopamine, and acetylcholine levels⁵⁸. Together, they support neurochemical balance, stress resilience, and cognitive clarity. Emerging evidence suggests epigenetic influences of these herbs on neurotrophic gene expression and inflammatory gene suppression⁵⁹. Standardization of dosage and quality control remains essential for their integration into evidence-based neurotherapeutics⁶⁰.

III. CONCLUSION

Medhya Rasayana plants offer a bridge between traditional Ayurvedic rejuvenation and modern neuropharmacology. The four classical herbs—*Centella asiatica*, *Glycyrrhiza glabra*, *Tinospora cordifolia*, and *Convolvulus pluricaulis*—exemplify safe, multi-target cognitive enhancers. Their integration into contemporary medical research can lead to innovative therapeutic options for neurodegenerative and stress-induced cognitive disorders. Further molecular and clinical exploration will enhance their global recognition as potent natural neuroprotectants.

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