



Review Article

DRUG REVIEW ON MEDHYA EFFECT OF YASTIMADHU W.S.R NOOTROPIC EFFECT

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ABSTRACT

Herbal medicines are increasingly sought after across both developed and developing nations for primary healthcare needs, largely due to their proven efficacy, favourable safety profiles, and minimal adverse effects. In the traditional system of Indian medicine, *Yashtimadhu* (*Glycyrrhiza glabra*) is one of the important neuro-nutrient herbs (*Medhya Rasayana*) mentioned in Ayurveda texts. *Glycyrrhiza glabra* is a perennial herb indigenous to the Mediterranean region and parts of Asia. The plant's root is the primary component used in herbal formulations, valued for its broad spectrum of pharmacological properties. Acharya Charak had mentioned about four *Medhya Rasayanas* specifically, in which *Yashtimadhu* is one of them, which are traditionally recommended for enhancing cognitive functions, improving concentration, boosting intelligence, and supporting overall mental performance. *Glycyrrhiza glabra* contains a diverse array of bioactive chemical constituents that contribute to enhanced brain function and cognitive performance. Among these are L-Phenylalanine and L-Tyrosine (including its more bioavailable form, N-Acetyl-L-Tyrosine), both of which are associated with cognitive enhancement. Along with its nootropic effects, it is also acclaimed for its hepatoprotective effects, gastroprotective effects, expectorant properties, neuroprotective actions, antiviral efficacy, anticancer potential, and anti-inflammatory activity.

INTRODUCTION

Herbal medicines are increasingly sought after across both developed and developing nations for primary healthcare needs, largely due to their proven efficacy, favourable safety profiles, and minimal adverse effects. These natural therapeutics hold promise in managing complex health conditions such as cognitive decline, osteoporosis, and immune-related disorders, where conventional treatments often remain limited or ineffective. Despite India's extensive biodiversity, profound traditional knowledge systems, and a longstanding heritage of herbal medicine, its contribution to the global herbal market remains minimal. This is primarily attributed to the continued export of unprocessed raw materials and crude

extracts, rather than value-added or standardized formulations [1]. India has rich ethnomedicinal heritage and botanical diversity, utilizing over 7,500 plant species for therapeutic applications [2]. *Glycyrrhiza glabra* commonly known as *licorice* or *Yashtimadhu* in Ayurveda has been traditionally used as hepatoprotective [3], gastroprotective [4], expectorant [5], neuroprotective [6], antiviral [7], anticancer [8], and anti-inflammatory [9] drug. Among these diverse therapeutic attributes, *Yashtimadhu* is particularly renowned for its neuroprotective capabilities. It has been studied for its ability to enhance memory function and mitigate neuroinflammation, thereby supporting its traditional use in cognitive and neurological health interventions [10].

Actions/ Karma [11]

✓ **Balya (Immune booster)**- *Yashtimadhu* strengthens the body's immunity and promotes overall vitality. It acts as a tonic (*Rasayana*), enhancing physical endurance and resistance against infections.

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- ✓ **Chakshusya (Vision promoter)**- It is considered beneficial for maintaining and improving ocular health. Regular use supports vision and helps in conditions related to eye fatigue and degeneration.
- ✓ **Varnya (Complexion enhancer)**- This property improves the quality and tone of the skin. *Yashtimadhu* promotes a healthy complexion by nourishing and purifying the skin from within.
- ✓ **Vatapittajit (Pacifies Vata and Pitta)**- It balances the vitiated *Vata* and *Pitta doshas*, helping in the management of conditions such as inflammation, acidity, restlessness, and dryness.
- ✓ **Raktaprasadana (Blood purifier)**- *Yashtimadhu* enhances the quality and circulation of blood. It supports detoxification and contributes to healthier tissues by promoting proper oxygenation and nourishment.

Ausadhyayoga (Formulations)

- *Yastyadi churna*
- *Yastyadi kwatha*
- *Madhuyastyadi taila*
- *Eladi gutika*
- *Anu tailam*



Root



Churna

Active Constituents [12-15]

1. **Flavonoid:** Isoliquiritin, licoisoflavonol, rhamnoliquiritin, shinpterocarpin, apioside, shinflavanone, and prenyllicoflavone.
2. Phenolic and coumarin derivatives 1-methoxyphaseolin, licopyranocoumarin, glisoflavone, licoaryl coumarin, and coumarin-GU-12.
3. Triterpenoid saponins: glycyrrhizin, glycyrrhizic acid, glycyrrhetic acid.
4. Isoprenoid-substituted phenolic constituents: isoangustone A, semilicoisoflavone B, licoriphenone, and 1-methoxyficifolinol.
5. Kanzonol R
6. Pentanol, tetramethylpyrazine, hexanol, terpinen-4-ol, linalool oxide isomers A and B, geraniol, and α -terpineol.

Nutritional Richness

- All the above constituents collectively contribute to the pharmacological profile and aromatic characteristics of licorice.
- Both raw licorice and its tea infusions are nutritionally rich, containing essential macronutrients such as proteins, fats, carbohydrates, dietary fibre, and moisture, along with raw ash and silica.
- They are also a source of various minerals, including calcium, phosphorus, sodium, potassium, zinc, and copper.
- It provides a diverse amino acid, such as serine, aspartic acid, glycine, glutamic acid, threonine, valine, proline, alanine, isoleucine, tyrosine, leucine, lysine, phenylalanine, and histidine.
- Presence of several organic acids, including acetic, propanoic, fumaric, citric, butyric, malic, and tartaric acids.

Amayikapravyoga (Therapeutic uses) [16, 17]

- *Yashtimadhu (Madhuyaṣṭi)* powder, when administered with *Kṛishra*, acts as a *Rasayana* (rejuvenative), particularly enhancing cognitive function and promoting intelligence.
- For enhancing lactation, *Yashtimadhu* powder is traditionally mixed with cow's milk and sugar and given to nursing mothers, supporting its galactagogue properties.
- A mixture of *Ghṛita* (clarified butter) and *Madhuyaṣṭi* (licorice) is traditionally used to alleviate burns caused by alkali substances, owing to its soothing and healing properties.
- The combination of 10 grams of *Madhuyaṣṭi*

powder with ghee and honey, followed by the consumption of milk, is believed to enhance sexual potency and vitality, according to Ayurvedic practice.

- A mixture of *Yashtimadhu* and *Candana* powders administered with milk is traditionally recommended in the treatment of *Raktapitta* (bleeding disorders), including haematemesis.
- A topical paste made from *Madhuyashti* combined with *Nimba* (neem) leaves is used for its wound-healing properties.
- *Charaka* recommended a paste made from licorice (*Yashtimadhu*) and *Picrorhiza kurroa*, administered with sugar water, as a cardi tonic for strengthening heart function.
- He also prescribed a combination of *Yashtimadhu* and *Santalum album* (sandalwood), powdered and mixed with milk, for the treatment of haematemesis.
- *Sushruta* advised the use of a 10-gram paste of *Yashtimadhu* for managing intrinsic hemorrhage, highlighting its haemostatic properties.
- For the treatment of oedema, a formulation consisting of a paste of licorice and *Sesamum indicum* (sesame), blended with milk and butter, was traditionally prescribed for its anti-inflammatory and diuretic effects.
- Warm clarified butter (*Ghrita*) mixed with licorice was traditionally applied topically to promote healing in wounds, bruises, and burns.
- The powdered form of *Yashtimadhu* is also used as *Nasya* (nasal insufflation) in the treatment of *Ardhāvabhedaka* (migraine).
- *Bhava Prakasa* reported the antiepileptic properties of *Yashtimadhu* when used in combination with *Kushmanda Swarasa* (juice of *Benincasa hispida*), highlighting its role in traditional epilepsy management.
- After application of *Kshara* (alkaline cauterization agent), a combination of *Ghrita* (clarified butter) and *Yashtimadhu* (*Glycyrrhiza glabra*) paste is recommended for topical application over the hemorrhoidal mass [18].
- Rice milk prepared with *Yashtimadhu* is prescribed for soothing vocal cords in hoarseness of voice [19].
- Administration of medicated milk with *Sarkara* (sugar), *Kasmarda* (*Cassia occidentalis*), and *Madhuka* (*Glycyrrhiza glabra*) is indicated to promote the growth and nourishment of Intrauterine Growth Retardation (*Garbha Kshaya*) [20].

Nootropic Effects

Maintaining brain health is essential for the effective regulation and coordination of bodily functions [21]. Nootropic agents are broadly recognized for their role in enhancing memory, cognitive function, intelligence, and serving as nerve tonics. They support brain function by increasing cerebral oxygenation and promoting nerve growth [22]. L- Phenylalanine and L- Tyrosine are associated with cognitive enhancement. Additionally, cholinergic compounds present in the plant play a significant role in modulating the neurotransmitter acetylcholine, which is essential for memory formation. By increasing the availability of acetylcholine in the brain, these agents support various cognitive functions. Cholinergic nootropics encompass acetylcholine precursors, cofactors, and acetylcholinesterase inhibitors, which improves neural communication and cognitive processing [23]. Amino acids are utilized by the brain for synthesizing enzymes, neurotransmitters, transport molecules, structural components, and other vital biochemical substances necessary for proper neural function [24]. L- tyrosine replenish these neurotransmitters, and enhance cognitive performance under stress, improving attention, alertness and promote a sense of well-being [25]. L-tryptophan contributes to improved decision-making and emotional stability by supporting mood regulation. Hence, these amino acids through their roles in neurotransmitter synthesis, antioxidative defence, and neurotrophic support represent valuable nutraceutical interventions for maintaining and enhancing brain health [26]. By mitigating oxidative damage, it helps to preserve cognitive function [27]. Isoflavones enhance cognitive function, their neuroprotective properties improve memory and overall mental performance [28]. Dehydroepiandrosterone (DHEA), is associated with notable cognitive-enhancing effects, contributing to improved mental performance and neuroprotection. It aids in preserving the capacity of brain cells to store and access information, particularly within short-term memory processes [29]. DHEA may contribute to longevity and promote a more youthful physiological state by supporting hormonal balance and cognitive function [30]. Glycyrrhizin, is approximately 60 times sweeter than sucrose. Human brain relies primarily on glucose as its main energy source, compounds like glycyrrhizin may play a supportive role in sustaining cognitive function by contributing to energy metabolism [31]. Approximately 30% of circulating glucose is present in the brain's extracellular fluid, with glucose levels typically stabilizing within 20 to 30 minutes following fluctuations in systemic glycemia [32]. Adequate glucose availability has been positively correlated with improvements in memory and learning capacity [33].

Research work supporting *Medhya* effect of *Yastimadhu*

1. In a controlled experimental study, researchers investigated the neuroprotective effects of *Glycyrrhiza glabra* by administering lipopolysaccharide (LPS) to mice in order to induce neuroinflammation and cognitive impairment that is to damages the brain. The mice were then evaluated for learning, memory, and anxiety-related behaviours using the Morris water maze and open field tests. Flavonoids extracted from the stems and leaves of *Glycyrrhiza glabra* were found to exert significant effects on various oxidative stress markers including superoxide dismutase (SOD), catalase (CAT), and malondialdehyde (MDA) as well as on key neurotransmitters and enzymes such as acetylcholine (ACh) and acetylcholinesterase (AChE). Additionally, the treatment influenced apoptotic markers (Caspase-3, Caspase-9) and modulated serum levels of pro- inflammatory cytokines, including TNF- α , IL-6, and IL-1 β [34].
2. A study evaluating the cognitive effects of Mediterranean natural extracts (MNE), including rosemary extract (RE) and *Glycyrrhiza glabra* root extract (GGRE), demonstrated notable improvements in cognitive behaviour in both adult zebrafish and rats. The findings suggest that MNE possesses neuroenhancing properties across different animal models, with *Glycyrrhiza glabra* contributing significantly to the observed cognitive benefits [35].
3. Liquiritigenin (LQ), a flavonoid derived from the root of *Glycyrrhiza glabra*, has been investigated for its potential cognitive-enhancing effects in models of scopolamine-induced learning and memory impairment. In this study, scopolamine (0.5 mg/kg, i.p.), a muscarinic receptor antagonist, was used to induce cognitive deficits in animals, which were then evaluated using the Y- maze, passive avoidance, and novel object recognition tests. The results indicated that LQ significantly ameliorated cognitive impairments, suggesting its potential therapeutic role in memory and learning disorders. These beneficial effects are believed to be mediated, at least in part, through the enhancement or protection of cholinergic neurotransmission [36].
4. Glycyrrhizic acid (GA), a major bioactive component of *Glycyrrhiza glabra*, has demonstrated neuroprotective effects in a vascular dementia (VD) rat model established through permanent bilateral occlusion of the common carotid arteries. The cognitive benefits observed in VD rats were attributed to GA's ability to reduce oxidative stress and inhibit voltage-gated sodium channels (VGSCs). These findings offer compelling experimental evidence supporting the potential therapeutic application of GA in managing cognitive impairments associated with conditions such as Alzheimer's disease, stroke, and traumatic brain injury [37].
5. The effects of chronic glabridin treatment on cognitive function were evaluated in both healthy and streptozotocin (STZ)-induced diabetic rats. The findings revealed that glabridin effectively prevented diabetes-associated cognitive impairments, preserving learning and memory functions. These results highlight glabridin's potential as a neuroprotective agent against diabetes -induced cognitive decline [38].
6. Aqueous extracts were assessed for their impact on spatial learning and memory in rats through exteroceptive behavioral models, including the Elevated Plus Maze, Hebb-Williams Maze, and Morris Water Maze tests. The results demonstrated significant cognitive improvements, suggesting the potential of these extracts in managing impaired learning, dementia, Alzheimer's disease, and other neurodegenerative conditions [39].
7. Researchers investigated the effects of glabridin, a bioactive compound derived from the roots of *Glycyrrhiza glabra*, on cognitive functions and cholinesterase activity in mice. The findings indicated that glabridin significantly enhanced memory performance, suggesting its potential utility in the management of Alzheimer's disease. These results warrant further exploration into glabridin's therapeutic value for neurodegenerative conditions [40].
8. Studies on *Glycyrrhiza glabra* have demonstrated its positive effects on learning and memory in mice, primarily through the facilitation of cholinergic transmission in the brain. Notably, licorice extract was able to reverse scopolamine-induced amnesia, further supporting its potential as a cognitive enhancer through modulation of the cholinergic system [41].
9. A study was carried out to evaluate the effects of *Glycyrrhiza glabra* extract, *Myristica fragrans* seed extract, and ascorbic acid on acetylcholinesterase (AChE) activity in the brains of mice. The results were compared to the activity of metrifonate, a known acetylcholinesterase inhibitor. The study measured AChE levels in brain tissue to assess the potential of these natural compounds in modulating cholinergic function, with implications for cognitive enhancement and neurodegenerative disease management [42].
10. Administration of aqueous *Glycyrrhiza glabra* extract for seven consecutive days in mice

demonstrated significant memory-enhancing effects across both exteroceptive and interoceptive behavioral models. The observed cognitive benefits were attributed to the extract's anti-inflammatory and antioxidant properties, highlighting its potential as a natural therapeutic agent for memory improvement [43].

11. The effects of *Glycyrrhiza glabra* L. extract on memory retention were evaluated in rats using the Morris Water Maze test. The findings revealed that the extract significantly enhanced spatial memory retention; however, this cognitive improvement did not correlate with the blood levels of glycyrrhizic acid (GA), suggesting that other bioactive constituents may contribute to the observed effects [44].

CONCLUSIONS

Yastimadhu has been used extensively for various ailments. Nootropic effect of *Yastimadhu* is one of the most effective areas which need more clinical work for further exploration. It has been broadly recognized for enhancing memory, cognitive function, intelligence, and serving as nerve tonics. It supports brain function by increasing cerebral oxygenation, promoting nerve growth and provide abundant energy source to brain.

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