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NEUROLOGICAL ACTIVITIES OF *TAGARA* (*VALERIANA JATAMANSI* JONES EX ROXB.)

A Literary Review

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Abstract

Background: *Valeriana jatamansi* Jones (Family: Valerianaceae), a high value medicinal plant, is distributed in many countries of Asia. The species has been widely utilized in both traditional and modern medicine, with *V. jatamansi* being particularly valued for its insect-repelling and anthelmintic properties. Similarly, indigenous systems of medicine, particularly in Asia, have reported neurological activities like neuroprotective, sedative, anxiolytic and neurodegenerative of the species in various ailments. This review highlights on the morphological characters, phytochemical composition, medicinal uses, and pharmacological activities of *V. jatamansi* along with compilation of neurological activities in various articles.

Materials and methods: Journals, articles and various internet publications were referred to compile the relevant information of *Tagara* (*Valeriana jatamansi* Jones) and compilation of its various neurological activities.

Result and discussion: A comprehensive review of existing literature reveals that *V. jatamansi* exhibits a broad spectrum of biological activities, including antimicrobial, antioxidant, anti-inflammatory, cytotoxic, antitumor, and neurologically beneficial effects such as neuroprotective, neurodegenerative, anxiolytic, antidepressant, and sedative properties. Even though there are reports about the pharmacological action of medicinal plant *Tagara (Valeriana jatamansi* Jones) in neurological diseases, more clinical based researches are required to substantiate their role in improving the well-being of the patient. Further investigation is necessary to fully understand the molecular mechanisms of *V. jatamansi*, and continued research efforts can potentially lead to the development of novel, evidence-based therapies for use in contemporary medicine.

Key words: *Tagara (Valeriana jatamansi* Jones ex Roxb), Neurological activities

Introduction

Valeriana jatamansi Jones ex Roxb or “Indian Valerian”, belongs to Valerianaceae family. [1] The word 'Valerian' derived from word 'Velo' meaning 'powerful drug', was first mentioned in the 9th century by an Indian physician. The term ‘Valerian,’ derived from the Latin word *valere*, signifies strength and denotes its aromatic and medicinal properties. [2] Most popular name for this genus is “Valeriana.” Commonly *Valeriana jatamansi* is referred as Indian Valerian, *Muskbala*, *Sugandhbala* (Hindi), and *Tagara* (Sanskrit).[3] The rhizomes and roots of *V. jatamansi* are used in Ayurvedic and Unani medicine to treat a variety of health conditions, such as insomnia, circulatory issues, respiratory problems, and skin diseases. Moreover, the plant's herbal oil is widely employed in perfumery and insect repellent formulations. The essential oil extracted from the root of *V. jatamansi*, which constitutes 0.8% of its content, is also utilized in pharmaceutical industries and hair care product manufacturing.[4] The overexploitation of Valerian rhizomes from their natural habitats has significantly depleted their populations in recent decades. Despite ongoing industrial demand, conservation efforts and production enhancements are underway. Moreover, research investigations into agro

and molecular technology are being conducted to further explore Valerian's therapeutic properties, which are attributed to Valmane, Valepotriates, and other bioactive compounds like iridoids, lignans, sesquiterpenoids, and alkaloids. [1]

With a long history of use in Europe, *Valeriana jatamansi* Jones has been extensively utilized as a medicinal herb and spice. Its therapeutic applications are now officially acknowledged in various pharmacopoeias, including Chinese, Indian, British, and European. The roots and rhizomes of this plant have long been used in traditional medicine to treat a range of conditions, such as anxiety disorders, sleep disturbances, irritable bowel syndrome, epilepsy, snake poisoning, and hyperlipidemia. *V. jatamansi* Jones is a key component of the health product *Tagara*, which is used to treat depressive insomnia. The plant's phytochemical constituents and extracts of plants show a wide range of biological activities, including, neuroprotective, anti-tumor, antidepressant, cytotoxic, gastrointestinal, anti-viral, sedative, antioxidant, and other effects.[5]

Distribution

The species is frequent in temperate Himalayas, from Kashmir to Bhutan and Khasi Hills. It grows naturally at altitudes of 1800–3000 m in northwestern Himalayas and between 1200 m and 1800 m in Assam and North-East India. Flowering, fruiting, and seed maturation take place in March through May. [6]

Morphological characters -

An aromatic, rhizomatous, and hairy dwarf perennial herb that attains a height of about 50 cm, characterized by horizontal, descending fibers, a pubescent stem, and radical leaves measuring 1–3 cm in diameter. [3] The rootstock measures 6–10 cm in thickness, bearing long fibrous roots entangled with irregular circular edges. The plant produces numerous stems ranging from 15–45 cm in length. Leaves are of two types—radical and cauline. Radical leaves (2.5–8 cm long and 1–3 cm wide) are cordate-ovate, long-stalked, and either sinuate or toothed. Cauline leaves are few in number, smaller in size, and may be entire or lobulated. The flowers are white or faintly pink arise in flat-topped corymbose clusters on upright, almost leafless peduncles. The species is dioecious, with male and female flowers occuring on separate plants. Corolla is with five lobes and funnel shaped. Fruits are crowned with a persistent pappus like a calyx. [5] *Valeriana* can be propagated either by seeds or vegetatively through rhizomes, with the rainy season being most suitable. In India, 24 species of Valerianaceae distributed across 4 genera have been documented. [7]

Phytochemical constituents

The plant contains an abundance of biologically active compounds, which are distributed throughout its leaves, stems, rhizome, and roots. However, the roots and rhizome are particularly notable for containing the majority of the commercially valuable phytochemicals and essential oils.[1] *V. jatamansi* consists of different chemical components but the main active constituents of Valeriana include coumarins, iridoids, sesquiterpenes, and lignanoids. Specifically, the sesquiterpenes comprise valerenic acid, valeranone, and valerenal, while the lignanoids include pinoresinol-4-o-d-glucoside and 8'-hydroxypinoresinol. Additionally, the iridoids consist of valepotriates, such as valtrate and didrovaltrate. Other constituents present in Valeriana include alkaloids (e.g., chatinine, thaliperphine), flavonoids (e.g., acacetin, quercetin), essential oil, volatile oil, sugars, starch, resin, bitter extractive matter, gum, and ketones.[4]

Ethnomedicinal Uses

In ethnomedicinal practices, the roots of *V. jatamansi* are utilized to treat various health conditions, including ulcers, convulsions, cardiac debility, general debility, jaundice, asthma, seminal weakness, dry cough, skin diseases, and leprosy. Additionally, the roots and rhizomes are recommended for treating insomnia, mental health conditions, blood and circulatory disorders. The plant exhibits excitatory effects on the central nervous system, acts as a nerve tonic, and is used for reducing anxiety and tremors. Its properties also extend to being a stimulant, hypotensive, and sedative. Furthermore, the plant's oil is valued in perfumery and insect repellent formulations. [4] Also it shows anthelmintic properties. Similarly, sedative, neurotoxic, cytotoxic, antidepressant, antioxidant, and antimicrobial activities of the species in various ailments in the indigenous system of medicine, particularly in Asia, are reported. [8]

Medicinal uses and pharmacological activities

Some research on neurological activities of *V. jatamansi* Jones are enlisted below:

Table 1 - Neurological activities of *Valeriana jatamansi* Jones

Activity	Plant part	Extract / compound	Model / system	Formulation / dosage	Result
Neuroprotective effects	Rhizome	Lypholized extract[9]	SH-SY5Y neuroblastoma cells	Powdered material with 50% methanol kept for 24 hr and filtered. The filtrate was lyophilized and used	The extract's IC50 value was was 2.21 mg/ml. In MPP+ treated cells 0.5 mg and 1 mg/ml dose exhibit significant improvement in cell viability, whereas after 8 and 16-hr post MPP+ treatment, the effect was significant at 1 mg/ml concentration. Significant protective effect of the extract (1 mg/ml) in tunicamycin-treated cells was observed only at 0 hr.
	Dried roots	Methanolic extract[4]	SH-SY5Y Neuroblastoma cells		Six compounds, including three new iridoids (valeriandoids A-C) and 3 previously reported compounds, were assessed for their neuroprotective effects against MPP+-induced dopaminergic toxicity in SH-SY5Y cells, using guanosine as a positive control. The results showed that 4 among these compounds exhibited moderate neuroprotection.
Neurodegenerative effect	Root	Extract in dichloromethane[10]	Wistar Albino rats	Extract 100 and 200 mg/kg, p.o. (suspended in 1% CMC solution)	Both extract doses significantly decreased the escape latency and retention transfer latency, as compared with intracerebroventricular-streptozotocin group. Administration of picrotoxin significantly reversed the effects produced by plant extract and valeric acid in intracerebroventricular-streptozotocin treated rats.

Anxiolytic effect	Whole plant[11] Radix and rhizome[4]	Ethanolic extract	Male, Sprague–Dawley rats Male ICR mice	Low (0.015 g/ml), medium (0.030 g/ml), and high (0.045 g/ml) extracts doses p.o. Treatment groups received oral doses of 1.2 g/kg, 2.4 g/kg, or 4.8 g/kg of *V. jatamansi* extract, while the control groups treated either saline or diazepam (2 mg/kg) for 10 consecutive days.	Expression of Elk-1, Ets-1, Apaf-1, Bax, and Bcl-2 genes were up-regulated in the model group. But the abnormal gene expressions were adjusted in the other groups, which suggest the important role of the species in regulating the abnormal apoptosis- related gene expression. The anxiolytic-like effects of *V. jatamansi* were significantly reduced by flumazenil treatment, indicating its potential as an anxiolytic agent without sedative effects. This suggests that *V. jatamansi* may be a preferable option for anxiety treatment due to its lack of sedative properties.
Acute toxicity	Roots and rhizomes[12]	Dichloromethane extract/essential oil	LACA mice	Three fixed doses of 25, 200, and 2,000 mg/kg	Oral administration of oil (10–2,000 mg/kg) did not produce toxic effect or lethality. Toxic effect and mortality was detected in mice up to 2,000 mg/kg, p.o. dose of extract during 48 hr of observation period.
Primary insomnia	Rhizomes[13]	Dry powdered material	Human	4g powdered material with milk	Significantly ($p < 0.001$) improve sleep initiation (76%), sleep duration (55.17%), disturbed sleep (69.58%), and disturbances in routine work (73.95%).
Sedative and tranquillizing effect	Roots and rhizomes[14]	Dried fractions	Adult male Wistar rats/adult male Swiss mice	6-Methylapigenin (MA) and 2S(-)-hesperidin (HN) dissolved by the sequential addition of	Intraperitoneal administration of HN at a dose of 2 mg/kg increased the sleeping time. This HN hypnotic action was potentiated by the addition of 1 mg/kg MA at the anxiolytic dose.

				10% di methyl sulfoxide, 10% ethanol, and 80% saline	
Antidepressant effect	Roots and rhizomes[15]	Dichloromethane extract	Mouse	P.o. 10, 20, and 40 mg/kg extract	Extract (40 mg/kg) significantly inhibited the immobility period. Similarly, chronic administration of 20 and 40 mg/kg extract significantly reduced the immobility period and significantly ($p < 0.05$) increased norepinephrine and dopamine level in mouse forebrain.
Anticonvulsant effect	Root [16]	Hydro ethanolic extract	Swiss albino mice	450 and 900 mg/kg given as intra-peritonial injections.	Hydroethanolic extract reduced the duration of HLTE with a dose dependant increase in potency at 450 and 900mg/kg given as intraperitonial injections. At 50:50, and 25:75 dose ratio (Vw: PBT) the combination showed synergistic interactions At 75:25 dose ratio (Vw : PBT) the combination showed antagonistic interaction
Antiepileptic effect	Dried root powder[17]	Ethanol extract	Male ICR mice (20+-2 g) and Sprague Dawley (SD) rats (200 +_ 20 g)	ICR mice were pretreated with phenytoin sodium (20 mg/kg, ip), valepotriate (5, 10 and 20 mg/kg, ip), and 1% DMSO (20 mL/kg, ip, control).	Valepotriate showed significant anti-epileptic activity against MES- and PTZ-induced epilepsy at doses of 5, 10, and 20 mg/kg, and ED50 values for MES- and PTZ-induced epilepsy were 7.84 and 7.19 mg/kg, respectively. Furthermore, valepotriate (10 and 20 mg/kg) can significantly prolong sleeping time and shorten the latency time on the pentobarbital sodium-induced sleeping time test. Furthermore, valepotriate (5, 10, and 20 mg/kg) could significantly up-regulate the expression of GABAA, GAD65, and Bcl-2

					and Caspase-3 expression was downregulated, whereas GABA expression remained unaffected.

***Ayurvedic* aspects**

The word meaning of *Tagara* denotes, which protects the life against poison as antidote or it acts as antidote for Kroda visa. [18] *Kutila, Natam, Anrju, Barhanam Dadruhasta Deenam, Jihmam, Kalaakhya, Kalanusaaryam, Kuncitam, Naghusham* etc are the synonyms explained in various Ayurvedic nighantus.[19-22] In Brhathrayees, Charakacarya explained in *Sitaprasamana Varga*[23], Susrutacarya explained in *Eladi Gana*[24] and Vagbhatacarya explained in *Badradarvadi Gana*[25]. Pharmacological properties includes *Tikta, Katu, Kashaya rasa*, *Snigdha, Laghu Guna, Ushna Veerya, Katu Vipaka,* Karma involves *Tridoshahara* Especially *Vatakaphahara*.[26] Therapeutically the drug used in *Apsmara, Unmada, Manodosha, Netra roga, Siroroga, Sula, Visa* etc. According to Rajamaarthanda *Tagara* administered in *pilla roga* and *sandhigatavata*. [18] The important formulations of *Tagara* includes *Dhanvantara tila, Mahanarayana Tila, Devadarvadyarishta, Jatiphaladi cura, Dushivisari gutika*. The dosage include 1-3 gm in powder forms. [27]

Discussion

This updated review primarily highlights the ethnobotanical significance, neurological activities and major chemical constituents of *V. jatamansi*, along with their biological properties. This species has been widely employed in both traditional and modern medicine specifically as a flavoring agent, analgesic, and fragrance component. Various pharmacological investigations on *V jatamansi* have demonstrated its capability in managing several illness including mental disorders, stress-related conditions, and gastrointestinal disturbances. Yet there is insufficient long-term clinical evidence to substantiate these outcomes. Research on the pharmacological properties of *V. jatamansi* indicates its potential as a drug source for treating various ailments. To validate the healing potential of *V. jatamansi*, further clinical research is required. Recent findings have expanded its biological profile, revealing antidiarrheal, analgesic, anti-HCV, and lipid metabolism regulating activities, in addition to its established traditional medicinal applications. Many studies both *in-vitro* and *in-vivo* shows result in neurological activity such as neuroprotective, neurodegenerative, antidepressant, anxiolytic, primary insomnia, antiepileptic, anticonvulsant, sedative & tranquilizing effect.

Tagara explained in *brihathrayee*s and also in many Ayurvedic *nighantu*s. Pharmacological properties shows it is a *Tiktharasa pradhana dravya* which helps in *Apasmara, Unmada nasana, Manodoshahara* and especially used in *visa.* Now a days the powder of *Tagara* as such used in different sleep related disorders.

Conclusion

This review concluded that *V. jatamansi* Jones ex Roxb. is a remarkable plant with broad pharmacological potential, extensive traditional applications and intricate chemical composition. Traditionally this herb has been utilized to treat numerous health conditions. Its phytochemical profile reveals the presence of compounds like valepotriates, sesquiterpenes, and alkaloids, which are responsible for the therapeutic effects.

Pharmacological evaluations reveal a wide spectrum of activities, including anti-inflammatory, antibacterial, cytotoxic, antioxidant, antitumour, analgesic and neurological activities include neuroprotective, neurodegenerative, antidepressant, anxiolytic, primary insomnia, antiepileptic, anticonvulsant, sedative & tranquilizing effect. Beyond confirming its traditional uses, these findings create opportunities for continued research and pharmaceutical development. To gain a comprehensive understanding of *V. jatamansi,* it is essential to acknowledge both its historical importance and its modern relevance across diverse system of medicine.

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