

Review on Valeriana Species- *Valeriana wallichii* and *Valeriana jatamansi*

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Abstract

Valeriana wallichii (Tagara) and *Valeriana jatamansi* (Jatamansi) are perennial herbs of Valerianeaceae family growing on higher altitude. Experimental studies proved its activity on anxiety, stress, sleep, depression, performance, alertness, GABA receptor, Orofacial dyskinesia and blood pressure along with toxicity on liver. Hence an effort was made to study the ethnopharmacological uses of *V. wallichii* and *V. jatamansi*. Numerous literature and electronic databases such as Science Direct, Pub Med, Springer, Medline and Wiley etc., were searched and information attained. Additional online academic libraries such as Google Scholar and ethnopharmacological literature were explored scientifically for more evidence on the plants. This review mainly focuses on the ethnopharmacological uses of *V. wallichii* and *V. jatamansi* and also the various chemical components present in the plant and their many beneficial effects such as anticancer, analgesic, antioxidant and neuroprotective effects. In this paper, we have conducted a review on *V. wallichii* and *V. jatamansi* especially in the area ethnopharmacology and phytopharmacology. This plant is in use since 2000 years. It is used in a treatment for inflammation, cancer, epilepsy, Parkinson's and Alzheimer's disease, etc. Further investigation is required in the area of pharmacokinetics and toxicology to contribute additional information on the therapeutic use and quality control of the plants.

Keywords: *Valeriana wallichii*, *Valeriana jatamansi*, Valerianeaceae.

INTRODUCTION

Valeriana wallichii also known as Tagara in Ayurveda is a hairy perennial herb belongs to Valerianeaceae family, growing in the temperate regions of the Himalayas and Khasia hills up to an altitude of 3,000m [1]. The plant leaves are hairy herb grown up to 45 cm in height. Rootstalk is thick, long-petioled, cordate and ovate, horizontal and usually sinuate, 2.5-2.75 cm in diameter, cauline leaves only a few, much smaller, entire or pinnate, often crowded stipules nil. Flowers of Valerian are deciduous, white to pink, in terminal corymbs and unisexual, male and female in different plants [2].

It has been used in Ayurveda as a medicine for various ailments and disorders from centuries. Their root has been used in the form of powder in a dose of 1-3g. Roots of Tagara contain Valerinic acid, Valepotriates which has been used as sedative and tranquilizers. Essential oils were usually obtained from the root and dried rhizomes. The essential oil contains sesquiterpene, valeric acid, camphene, terpineol and terpene alcohol [3].

Valeriana jatamansi DC. is a tiny, recurrent and most primitive species of Valerianeaceae family. The plant has been used as traditional medicine in Ayurveda, Siddha, Homeopathy, ethnomedicine and Indian System of Medicine (ISM), which is spread in the Himalayas [4]. It is obtained from the wild in the Netherlands, France Britain, Belgium, Eastern Europe, Germany and Japan [5].

It consists of different chemical components but the main bioactive constituents in the plants are coumarins and sesquiterpenes [6]. Valeranone or jatamansone is the major sesquiterpene [7]. The other sesquiterpenes contains α -patchoulene, angelicin, β -patchoulene, calarene, β -sitosterol, jatamansin, jatamansinol [8], jatamansone, patchouli alcohol, Oroselol, valeranal, valeranone, seychellene, seychelane, nardostachnol, nardostachone [9, 10]. Jatamansic acid [10], jatamansone semicarbazone, lupeol, Calarenol [11], terpenic, heptacosanyl pentanoate were isolated from rhizomes of *V. jatamansi* [12]. An alkaloid called actidine has also been stated [13]. The plants *V. wallichii* (Tagara) and *V. jatamansi* were depicted in Figure 1.



Valeriana wallichii



Valeriana jatamansi

Fig. 1: Plants: *Valeriana wallichii* and *Valeriana. Jatamansi*

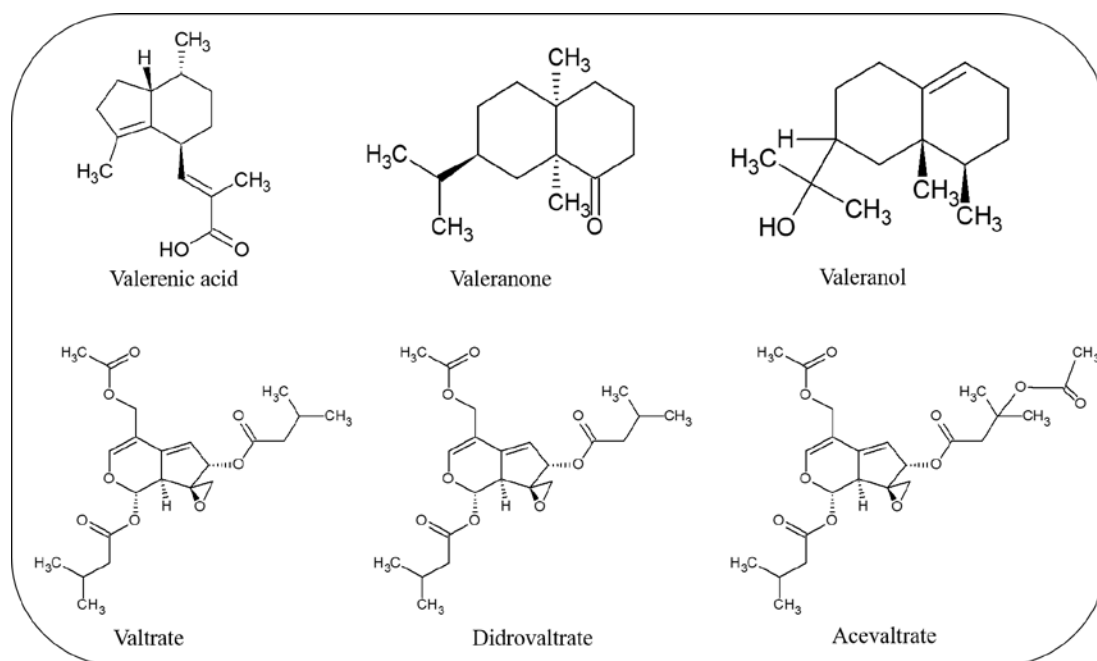


Fig. 2: Chemical constituents of *V. wallichii* and *V. jatamansi*

In this review of the literature, an endeavour is made to present a general outline of ethnopharmacological uses of Indian traditional medicine, phytochemical properties and pharmacological actions of *V. wallichii* and *V. jatamansi*, thus the openings and areas needing advance research of these plants can be highlighted.

Taxonomic classification

V. wallichii and *V. jatamansi* belong to the Valerianaceae family [14]. Taxonomic classification of these plants was given in **Table 1**.

Table 1

| Classification | <i>V. wallichii</i> | <i>V. jatamansi</i> |
|----------------|---------------------|---------------------|
| Kingdom | Plantae | Plantae |
| Division | Mangnoliophyta | Mangnoliophyta |
| Order | Dipsacales | Dipsacales |
| Family | Valerianaceae | Valerianaceae |
| Genus | <i>Valeriana</i> | <i>Valeriana</i> |
| Species | <i>wallichii</i> | <i>jatamansi</i> |

Chemical Constituents of *V. wallichii* and *V. jatamansi*

V. wallichii and *V. jatamansi* contains various phytoconstituents [15-17] and most important constituents are shown in the **Figure 2**.

Phytochemistry of *V. wallichii* and *V. jatamansi*

Isolation of a novel compound from the rhizomes of *V. wallichii* described as 4-methoxy-8-pentyl-1-naphthoic acid by spectral techniques [18]. Vedant M *et al* acylated acacetin-7-*O*-rutinoside of *V. wallichii* showed a mixture of its 2''-*O* and 3''-*O*-2-methylbutyryl esters by ¹³C-NMR, GLC and MS [19].

Conventional methodologies for estimating the chlorophyll content in leaves were calculated by and the investigation was focused to establish whether the CCM-200 Chl meter, evaluated the Chl content of *V. Jatamansi* in a non-destructive method [20]. Separation of three novel

iridoids, jatamanin Q and jatamanvaltrates R-S, in addition to three new sesquiterpenoids, clovane-2 β -isovaleroxy-9 α -ol and valeriananoids D-E, composed with 9 familiar compounds were isolated from roots of *V. jatamansi* Jones. Structures of novel compounds were determined by the general spectroscopic study [21].

Isolation of 15 chlorinated valepotriates, considered as chlorovaltrates A-O, together with six known compounds. Their structures were elucidated by spectroscopic methods as well as homo- and heteronuclear two-dimensional NMR experimentations [22]. GC-MS study of root identified 20 compounds expressive over 72% of essential oils. While associating with root samples from wild individuals, considerably higher total phenols, flavonoids and antioxidant activity were detected [23]. Different extracts showed dissimilarity in the presence of phytochemical constituents and physicochemical properties but chromatographic studies exhibited that all extracts contained valtrate [24].

Jing X *et al* isolated three novel iridoids, valeriandoids A-C together with three known analogues from *V. jatamansi* roots. Their structures and relative conformations were discovered by spectroscopic methods (IR, ESI-MS, HRESIMS, 1D and 2D NMR) and by assessment of NMR data with similar compounds. All the isolated compounds were assessed for their neuroprotective activity [25]. Singh RD *et al* conducted seasonal alteration of plant growth and content of increased fraction of valepotriates and essential oil in its underground portions [26].

Pharmacological activity of *V. wallichii* and *V. jatamansi* Neuroprotective activity

Exploration of the neuroprotective properties of *V. wallichii* comprising valeric acid and its plausible mechanism of action in amelioration of intracerebroventricular streptozotocin induced

neurodegeneration in Wistar rats were performed. Picrotoxin (2 mg/kg) was used as GABA-A antagonist. *V. wallichii* and its component valeric acid have the significant neuroprotective action to ameliorate memory and retentive property through GABA receptor distinction in rats [27]. *V. wallichii* aqueous root extract on sleep-awaken profile and level of brain monoamines on Sprague-Dawley rats were executed and EEG and EMG variations were observed telemetrically. Sleep latency was reduced and the length of non-rapid eye movement (NREM) sleep was amplified in a dose-dependent manner [28].

Antidepressant activity of root essential oil of *V. wallichii* patchouli alcohol chemotype in together acute and chronic management study via forced swim test (FST). Essential oil (20 mg/kg) was forbidden by pretreatment of mice using L-arginine (750 mg/kg i.p.) and sildenafil (5 mg/kg i.p.). The study established that nitric oxide pathway was involved in helping the antidepressant-like effect of essential oil [29]. Investigation of the antidepressant effect of dichloromethane extract of *V. wallichii* patchouli alcohol chemotype. The extract confirmed antidepressant effect and considerably increased the norepinephrine and dopamine levels in forebrain [30]. Demonstration of anxiolytic activity with various GABA-A receptor agonist diazepam, which was used to evaluate the potentiation of the extract by hole board test. The study suggested that, a promising consumption of hesperidin to reduce the effective therapeutic doses of benzodiazepines [31].

The occurrence of 2S(-)-hesperidin in *Valeriana* was described that has sedative and sleep enhancing properties. 6-methylapigenin was found to have anxiolytic activity and able to potentiate the sleep-enhancing properties of hesperidin which have activity on CNS, and their properties suggested that they are promising drug leads in the field [32]. A new secoiridoid glycosides, isopatrinoside and valeriananoid F, together with nine well-known constituents were isolated from the roots of *V. jatamansi*. Of the eleven isolates, vibutinal and isopatrinoside compounds revealed reasonable neuroprotective effects against CoCl_2 -induced neuronal cell death in PC12 cells [33]. Assessment of the promising beneficial effect of Mentat against transient ischemia-induced brain injury in rats. Various neurobehavioral and biochemical parameters were carried out, followed by morphological and histopathological evaluation of brain tissue was executed. Mentat possesses noteworthy neuroprotective effect against I/R-induced brain damage in rats and can be a valuable adjunct in the management of ischemic stroke and its rehabilitation especially with associated memory impairment [34].

The gene expression variance of the apoptosis-related gene in normal rats, anxiety model rats and rats treated by the extract of *V. jatamansi* were observed by using the gene chip technology. Compared with the normal group the expression of Elk-1, Ets-1, Apaf-1, Bax and Bcl-2 were up-regulated in the model group. But the abnormal gene expression was adjusted in the other groups. The study concluded that the antianxiotic mechanism of *V. jatamansi* is closely connected with the adjustment to the gene expression profiling of the apoptosis-related genes

[35]. Two new valerilactones A, B, bakkenolides and two known analogues, bakkenolide-H and bakkenolide-B from the tubers of *V. jatamansi*. Valerilactones A, B and bakkenolide-H compounds showed effective neuroprotective properties contrary to MPP⁺-induced neuronal cell death in human dopaminergic neuroblastoma SH-SY5Y cells [36]. Investigation of 76 plant extracts including methanolic and successive water extracts from 37 Indian medicinal plants for acetylcholinesterase (AChE) inhibitory activity by *in vitro*. The potent AChE inhibiting methanolic plant extracts included *Withania somnifera* (root), *Semecarpus anacardium* (stem bark), *Embelia ribes* (Root), *Tinospora cordifolia* (stem), *Ficus religiosa* (stem bark) and *Nardostachys jatamansi* (rhizome). The study resulted from *V. jatamansi* on AChE activity and its neurotrophic effects may partially explain the traditional use of this plant for refining cognition [37].

Antioxidant and Anti-inflammatory Activity

The antioxidant and anti-inflammatory activity of *V. wallichii* extract in MPTP induced mice. PD induced mice were administered orally with three different doses (50, 100 & 200mg/Kg body weight) of plant extract for 14 days and their interactive changes were studied. From the study, it was concluded that *V. wallichii* rhizome extract has the potential to improve oxidative stress and inflammatory destruction in PD [38]. Total phenolics, flavonoids contents and antioxidant activity by three different *in vitro* assays, exposed a significant variation across populations. The higher total phenolics, flavonoids, tannin content and antioxidant activity was observed in Kalika population [39].

Adaptogenic activity

An adaptogenic potential of aqueous extract of *V. wallichii* by Cold Hypoxia-Restraint (C-H-R) animal model was performed. HPTLC analysis was carried out and phytochemical analysis in terms of total phenol, total flavonoids, antioxidant potentials, reducing power etc., and the aqueous extract of roots of *V. wallichii* had adaptogenic action as evaluated by C-H-R animal model [40].

Antispasmodic Activity

Antispasmodic and blood pressure lowering activities of *V. wallichii* rhizome extract and its fractions to rationalize some of the folkloric uses. In rabbit aortic preparations, plant extract produced a selective and glibenclamide-sensitive relaxation of low K^+ (20 mM)-induced contractions. Antispasmodic and hypotensive properties of *V. wallichii* are facilitated probably through KATP channel activation, which justified its usage in gastrointestinal and cardiovascular complaints [41].

Pesticidal Activity

Screening of pesticidal activity of plant extracts could lead to the discovery of new agents for pest control. The study was carried out to evaluate the pesticidal properties in five medicinal plants (*Berberis lycium* L., *Hedera nepalensis* L., *Acorus calamus* L., *Zanthoxylum armatum* L. and *Valeriana jatamansi* L.), growing plentifully in the area of mid hills of western Himalayas, against some agriculturally important pests such as *Aphis craccivora* Koch, *Tetranychus rticae* Koch and larvae of *Spodoptera litura* Fab, *Plutella xylostella* L. and *Helicoverpa armigera* Hub.

Most of the extracts/essential oils were active only against *A. craccivora*. The results of the study would be advantageous in encouraging investigation targeting at the progress of the new agent for pest control from the plants with therapeutic values [42].

Toxicity Studies

Keke X et al (2015) evaluated the safety of iridoids rich fraction from *V. jatamansi* Jones (IRFV). The acute and sub-chronic toxicity of IRFV were investigated by employing established methods. The general behavior of the rats was observed and recorded daily. In the acute toxicity study, no significant change was found in the body weight of the mice in the control group and those in the drug group. The maximum tolerated dose of IRFV on mice was 3200mg/kg, which is 2666 times of the clinical adult daily dose. In the sub-chronic toxicity study on rats, the daily single oral doses of the IRFV did not result in death nor affected the general behavior at all tested doses [43-44].

CONCLUSION

Valeriana wallichii (Tagara) and *Valeriana jatamansi* (Jatamansi) are belonging to the family Valerianaceae, therapeutically used in Indian traditional system of medicine due to the existence of various bioactive compounds and its healing properties. The phytochemical outcomes have revealed a variety of chemical components in *Valeriana* species. Pharmacological studies exhibited that *V. wallichii* and *V. jatamansi* influenced different biological activities, viz., antioxidant, anti-inflammatory, anticancer, anticonvulsant, anti-Parkinson's and anti-Alzheimer's disease, etc. Although great progress on the phytochemistry and pharmacology of both *V. wallichii* and *V. jatamansi* have made, still there is a necessity for more conclusive studies on the safety, efficacy and *in vivo* toxicity of extracts and pure compounds to attain a better understanding. These indications validate the ancient privilege of Ayurveda concerning therapeutic potential of *V. wallichii* and *V. jatamansi*.

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