



# A review: pharmacognostics and pharmacological profiles of *nardastachys jatamansi* dc

Habibur Rahman, Hamed Ali.Shaik, P.Madhavi and M. Chinna Eswaraiah

Department of Pharmacognosy, Anurag Pharmacy College, Ananthagiri (V), Kodad (M), Nalgonda (Dt.), A.P-508206, India.

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## ABSTRACT

*Nardostachys jatamansi* DC is used by Mary to anoint Jesus's feet and mentioned Holy Quran and Bible besides evolutionary ideas in Ayurveda. The plant abounds in sesquiterpenes predominantly; jatamansone and nardostachone. The plant has demonstrated several pharmacological activities including hepatoprotective, cardio protective and hypolipidemic and antifungal. The significant effect is on the central nervous system, as diverse pharmacological actions, ranging from sedative to nootropic have been reported. Animal and clinical research with jatamansone, the active principle of the plant, has justified hypno-sedative claim of Ayurveda. The review summarizes, phytochemical and pharmacological investigations carried out on the plant.

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## Introduction

### Pharmacognostic profile

#### Botanical classification

*Nardostachys grandiflora* DC or *Nardostachys jatamansi* DC belongs to the family Valerianaceae. Botanical classification of the plants is given below [1].

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Dipsacales
Family	:	Valerianaceae
Genus	:	<i>Nardostachys</i>
Species	:	<i>Jatamansi</i>
Botanical name	:	<i>Nardostachys jatamansi</i> DC

Vernacular names [2, 3]

#### Indian Local Names

Sanskrit-Mamsi, Jatamansi, Bhytajata, Tapaswani;  
Assamese –Jatamansi; Bengali –Jatamansi; Gujarathi –  
Baalchad; Hindi-Balchara; Kannada-Bhootajata; Kashmir-  
Bhutijata; Malayalam-Manchi; Marati-Jatamansi; Orissa-  
Jatamansi; Punjab –Billilotan; Tamil-Jatamanji; Telugu-  
Jatamansi.



Fig: Aerial Parts of *Nardostachys jatamansi* DC

#### Foreign Names

English- Muskroot, Indian spikenard; French- Nard Indian;  
German- Achte Narde; Greek- Narde Indike; Arabic-Sambul-u-

'1 hind; Persian- Sunbul uttib; Chinese- Gan Song, Xiang Song;  
Nepali-Japoy.

#### Habitat [2]

This herb is growing at higher elevations up to 17,000 ft on Alpine Himalaya, in Nepal, Bhutan and Sikkim.

#### Historical Background [4]

The plant has been valued for centuries in Ayurvedic in Indian, Unani in ancient Greek and Arab, and in ancient Egypt and Rome for its medicinal values.

This drug registered in the book 'Ben Cao Shi Yi' in China, originates from 'Song Zhou' of Chuan Xi. *N. jatamansi* was used as perfume in Patroklos by Achilles in mentioned in the 'Book 18 of Homer's Iliad'. It is also mentioned a number of times in the 'Old Testament'.

It was used as one of the Eleven Herbs for the Incense in the Holy Temple in Jerusalem; it is mentioned twice in the biblical love poem, the 'Song of Solomon (1:12 and 4:13)'.

It is mentioned that Mary uses a pound of pure *N. jatamansi* to anoint Jesus's feet.

The powdered root of *N. jatamansi* is also mentioned in some Islamic traditions as the fruit which Adam ate in Paradise, which God had forbidden him to eat. *N. jatamansi* is also used to season foods in Medieval European cuisine, especially as a part of the spice blend used to flavor. Hippocrates used in sweetened and spiced wine drink.

#### Description [5]

*N. Jatamansi* DC is perennial herb whose rhizome and roots is mainly used as drug. The plant is about 10 to 60 cm in height and with stout and long woody root stocks.

The leaves are rosy, slightly pink or blue in dense cymose.

Colour: Dark grey rhizomes are crowned with reddish brown tufted fibers. Internally they are reddish brown in colour.

Odour: Highly agreeable, aromatic.

Taste: Acrid, slightly bitter and aromatic.

Size: Rhizomes are 2.5 to 7.5 cm in length.

Shape: Elongated and cylindrical.

### Uses in traditional system of medicine [6]

*N. jatamansi* DC a plant indigenous to India has been prescribed in this country since 800 B.C. for a diversified group of ailments such as hysteria, cholera, palpitations, epilepsy and similar convulsive disorders. Root and rhizome of it has bitter taste, aromatic, antispasmodic, diuretic, nerve sedative, nerve stimulant, tonic, carminative, sedative to spinal cord, promotes appetite and digestion.

### Action and uses in Ayurveda and Siddha [7]

Medhya (Brain tonic), Rasayana (Rejuvenative to the mind), Nidrajnana (Promotes sleep), Manasrogaghna (Alleviates mental diseases), Pachana (Digestive), Kasaswasahara (Alleviates coughs and breathing difficulties), Kushtaghna (Stops skin diseases and itching), Daha prashamana (Stops burning sensations), Varnya (Benefits complexion) and Roma sanjanana (Promotes hair growth).

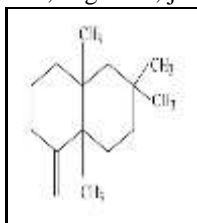
### Action and Uses in Unani [8]

In the Unani system of Medicine, *N. jatamansi* DC is used as hepatoprotective, cardio tonic, diuretic and analgesic.

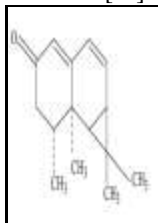
### Phytochemistry

The chemical composition of *N. Jatamansi* DC is highly complex containing volatile essential oil and other biological active compounds. Although all parts including roots and rhizomes have significant and different medicinal properties. The principle compound Jatamansone obtained from the rhizomes.

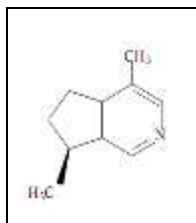
The main active constituents in the plant material are sesquiterpenes and coumarins [9]. Jatamansone or valeranone is the principal sesquiterpene [10]. Other sesquiterpenes include nardostachone, dihydrojatamansin, jatamansinol, jatamansic acid [11], jatamansinone, jatamansinol, oroseolol, oroselone, seselin, valeranone, nardostachyin [12], nardosinone, spirojatamol [13], jatamol A and B [14], calarene [15], seychellene, seychelane, coumarin: jatamansin or xanthogalin [16]. More over roots contain Valeranone, valeranone, nardone, calarene, nardostachone, n-hexacosanyl arachidate, 8 n-hexacosanol, calarene, n-hexacosane, n-hexacosanyl isovalerate,  $\beta$ -sitosterol, norseychelane, seychellene, patchouli alcohol and  $\beta$ -patchoulene [17] Roots oil contains Terpenic coumarins, oroselol, jatamansin, hydrocarbons,  $\beta$ -eudesmol, elemol,  $\beta$ -sitosterol, angelicin, jatamansinol [18].



Jatamansone



Nardostachone



Actinidine

Physiochemical properties of jatamansi oil [19]

### Organoleptic Properties

Appearance: Fluid to slightly viscous liquid.

Color : Varies from amber to deep blue or greenish blue.

Aroma: Heavy, sweet-woody and spicy-animal odor.

### Physico-chemical Properties

Specific gravity: 0.9300 to 0.9587 at 25° C

Refractive index: 1.5055 to 1.5458 at 25° C

Acid number: 1.5 to 8

Ester number: 6 to 45

Ester number after acetylation: 40 to 65

Solubility: Soluble in 0.4 to 1.5 vol. of 90% alcohol.

### Pharmacological Activity

#### Hepatoprotective activity [20]

Ali S *et al* pretreatment of rats with 800 mg/kg body wt of the 50% ethanolic extract of *N. jatamansi* DC demonstrated significant hepatoprotective activity against thioacetamide induced hepatotoxicity. Marked reduction in raised levels of serum transaminase and alkaline phosphatase was observed. Pretreatment of the animals with the extract further resulted in an increase in survival in rats intoxicated with LD<sub>90</sub> dose of the hepatotoxic drug.

#### Cardio protective [21]

Subashini R *et al* pretreatment with *N. jatamansi* DC extract significantly prevented and restored the antioxidant enzyme activity and lipid peroxides to near normal levels on rats due to doxorubicin (15 mg/kg, i.p.) induced myocardial damage. Restoration of cellular normality accredits the *N. jatamansi* DC with a cytoprotective role in doxorubicin-induced cardiac damage.

#### Hypolipidemic activity [22]

Subashini R *et al* Pretreatment with ethanolic extract of *N. jatamansi* DC (500 mg/kg) orally for seven days to doxorubicin induced rats showed a significant prevention in the lipid status with the activities of the lipid metabolizing enzymes. Histopathological observations were also in correlation with the biochemical parameters. These findings suggest that the protective and hypolipidemic effect of *N. jatamansi* DC against doxorubicin induced myocardial injury in rats could possibly be mediated through its anti lipid peroxidative properties [22].

Dixit VP *et al* pretreatment on rats with 50% ethanolic extract of *Curcuma longa* (tuber) and *N. jatamansi* DC (whole plant) elevated the HDL-cholesterol/total cholesterol ratio in triton-induced hyperlipidemic. There also was a reduction in the ratio of total cholesterol/phospholipids [23].

#### Cognition and memory improvement [24]

Vinutha JP *et al* investigated Acetyl cholinesterase inhibitory activity of methanolic and successive water extracts of *N. jatamansi* DC (rhizome), in vitro. Results indicated that methanolic extracts to be more active than water extracts. The IC (50) values obtained for methanolic and successive water extracts of *N. jatamansi* DC was 47.21µg/ml. These results partly substantiate the traditional use of *N. jatamansi* DC for improvement of cognition.

Vinutha JP *et al* pretreated with (50, 100, and 200 mg/kg, p.o.) of an ethanolic extract of *N. jatamansi* DC for 8 successive days to both young and aged mice. The 200 mg/kg dose of *N. jatamansi* DC ethanolic extract significantly improved learning and memory in young mice and also reversed the amnesia induced by diazepam (1 mg/kg, i.p.) and scopolamine (0.4 mg/kg, i.p.) [25].

Joshi H *et al* studied the memory improvement activity of *N. jatamansi* DC on amnesia due to natural aging of mice and scopolamine induced amnesia [26].

#### Anticonvulsant activity [27]

Rao VS *et al* studied ethanol extract of the roots of *N. jatamansi* DC was studied for its anticonvulsant activity and neurotoxicity, alone and in combination with phenytoin in rats. The results demonstrated a significant increase in the seizure threshold by *N. jatamansi* DC root extract against maximal electroshock seizure model as indicated by a decrease in the extension/flexion ratio. However, the extract was ineffective against pentylenetetrazole-induced seizures. Further, pretreatment of rats with phenytoin at a dose of 12.5, 25, 50 and

75 mg/kg in combination with 50mg/kg of *N. jatamansi* DC root extract resulted in a significant increase in the protective index of phenytoin from 3.63 to 13.18.

#### Antidepressant activity [28]

Prabhu V *et al.* studied the effect of acute and subchronic administration of alcoholic extract of the roots of *N. jatamansi* DC on norepinephrine (NE), dopamine (DA), serotonin (5-HT), 5-hydroxyindoleacetic acid (5-HIAA), gamma-aminobutyric acid (GABA), and taurine on male albino Wistar rats. The acute oral administration of the extract did not change the level of NE and DA but resulted in a significant increase in the level of 5-HT and 5-HIAA. A significant increase in the level of GABA and taurine was observed in the drug-treated groups when compared to the controls. A 15-day treatment resulted in a significant increase in the levels of NE, DA, 5-HT, 5-HIAA, and GABA.

#### Antiparkinson's activity [29]

Ahmad M *et al.* treated with 200, 400, and 600 mg/kg of *N. jatamansi* DC roots for 3 weeks in rats. Antiparkinsonism activity was studied on 6-OHDA (12 µg in 0.01% in ascorbic acid-saline) induced Parkinsonism. Three weeks after the 6-OHDA injection, the rats were tested for neuro behavioral activity and quantification of catecholamines, antioxidants, dopaminergic D2 receptor binding and tyrosine hydroxylase expression were also estimated. The increase in drug-induced rotations and deficits in locomotor activity and muscular coordination due to 6-OHDA injections were significantly and dose-dependently restored by *N. jatamansi* DC.

#### Neuroprotective activity [30]

Salim S *et al.* pretreatment with an alcoholic extract of *N. jatamansi* DC dosed at 250 mg/kg of for 15 days protected rats against focal ischemia caused by middle cerebral artery occlusion. The protective effect may be associated with improving glutathione content, inhibiting lipid peroxidation, and activity on the Na<sup>+</sup>/K<sup>+</sup> ATPase and catalase enzyme systems.

#### Antifungal [31]

Sarbhoy AK *et al.* tested Jatamansi oil for efficacy against *Aspergillus flavus*, *A. fumigatus*, *A. sulphureus*, *Mucor fragilis*, and *Rhizopus stolonifer*. This oil was found to be fungistatic or fungicidal to one or the other molds, depending upon the concentrations.

#### Tranquilizing activities [32]

German R *et al.* investigated sesquiterpene valeranone (Jatamansone) isolated from *Nardostachys jatamansi* DC rhizomes for tranquilizers activity in rodents and significantly the prolongation of barbiturate hypnosis, the impairment of rotarod performance, as regards the hypotensive property was demonstrated.

#### Others activities

Animal studies done on jatamansone have reported antioestrogenic activity [33], moreover, jatamansone have reported anti arrhythmic and antihypertensive activity [34], antiasthmatic [35], nematocidal [36] and antibacterial [37].

#### Toxicological studies [38]

Sesquiterpene valeranone, in toxicological studies on rats and mice an oral LD<sub>50</sub> of greater than 3160 mg/kg was found, which suggests the possibility of a therapeutically useful dose ratio.

#### Clinical Studies [39]

Preliminary clinical studies with jatamansone reported reduced incidence of aggressiveness, restlessness, stubbornness and insomnia. In a study conducted on hyperkinetic children, jatamansone, D-amphetamine and chlorpromazine were

compared for efficacy. Jatamansone and amphetamine significantly improved behavior in reducing aggressiveness and restlessness.

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