



**A Review on Chemical Constituents and Pharmacological Uses of
Nardostachys jatamansi DC**

Narayan Sharma

*Department of Pharmaceutical Chemistry, Doon (PG) Paramedical College and Hospital,
Dehradun, Uttarakhand, India*

ABSTRACT

Nardostachys jatamansi is a perennial herb found mainly in temperate and alpine Himalayas. It is used as medicine in ayurveda, homeopathy, ethno medicine and Indian system of medicine as well as in modern medicine industry. The essential oil as well as hydro-alcoholic extract of plant has been found to contain many therapeutically important chemicals. This review article summarizes some chemical constituents of plant and some pharmacological uses as reported by various studies in recent years.

Keywords: *Nardostachys jatamansi*, Chemical constituents, Pharmacological uses.

*Corresponding Author Email: snarayan3331@gmail.com
Received 07 July 2017, Accepted 17 July 2017

Please cite this article as: Sharma N *et al.*, A Review on Chemical Constituents and Pharmacological Uses of *Nardostachys jatamansi* DC. American Journal of Pharmacy & Health Research 2017.

INTRODUCTION

Nardostachys jatamansi has great medicinal value. Many research works have been done on this plant and many biologically active compounds have been isolated from extract as well as from essential oil proving many of them therapeutically potential. *Nardostachys jatamansi* is a perennial herb distributed mainly in temperate and alpine region of India [1], south west china [2], Nepal [3], Bhutan [4] Sikkim [5], Myanmar, Afghanistan, and Pakistan [6]. Taxonomical classification of plant is given below.

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Dipsacales

Family: Valerianaceae

Genus: *Nardostachys*

Species: *Jatamansi*

Botanical name: *Nardostachys jatamansi*

Part used in medicine: Rhizomes, Rhizomes oil

The species has very long history of use as medicine in Ayurveda, Homeopathy, ethno medicine and Indian System of Medicine to modern medicine industry. It is obtained from wild and cultivated plants in Britain, The Netherlands, Belgium, France, Germany, Eastern Europe and Japan.

CHEMISTRY OF *NARDOSTACHYS JATAMANSI*

Essential oil constituents

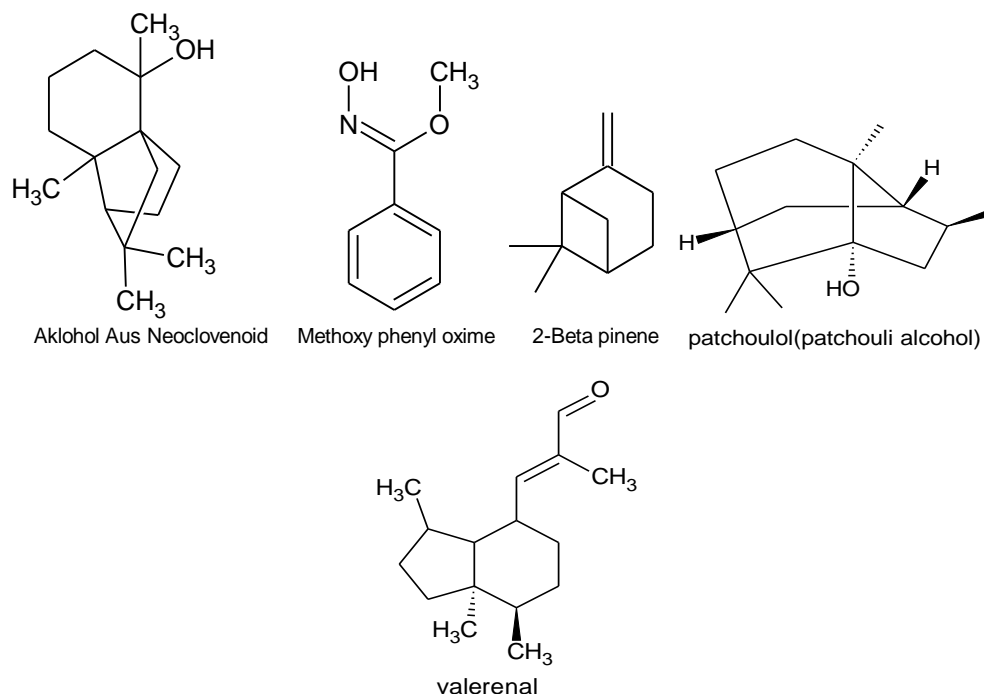
Essential oil is the odorous and volatile products of various plant and animal species. Essential oils have a tendency to evaporate on exposure to air even at ambient conditions and are therefore also referred to as volatile oils or ethereal oils. They mostly contribute to the odoriferous constituents or 'essences' of the aromatic plants that are used abundantly in enhancing the aroma of some spices [7]. More than 80 components of essential oil of *Nardostachys jatamansi* have been reported in sample collected from different regions of Nepal. Major components include 2-Beta pinene, Methoxy phenylxime and Alcohol aus neoclovenoxid [8]

Hydro-alcoholic extract constituents

Hydro-alcoholic extract of roots of *Nardostachys jatamansi* have been found to be contained with fixed oils, alkaloids, flavonoids, tannins, saponin, proteins and amino acids, carbohydrates,

terpenoids, glycosides and lactones [8]. More than ten compounds have been reported from phytochemical investigation of hydro alcoholic extract of the plant samples collected from different regions of Nepal. The major components include patchouli alcohol and valerenal [8].

Structures



PHARMACOLOGICAL USES

Nardostachys jatamansi has been found to be a potential therapeutic agent in the treatment or management of different body ailments as below.

Antibacterial and antifungal activity

Nardostachys jatamansi is effective against most of the microorganisms thereby justifying its role as antimicrobial and antifungal agent. The plant have been found to be active against number of bacterial strains such as *E. coli* (ATCC 25922), *K. pneumonia* (ATCC 700603), *P. aeruginosa* (ATCC 27853), *S. typhimurium* (ATCC 14028), *S. aureus* (ATCC 25992) and *M. luteus* [8]. Fungi static spectrum of *Nardostachys jatamansi* have been evaluated and the results showed that the plant is effective against *Aspergillus flavus*, *Aspergillus niger* and *Fusarium oxysporum* [9]. In another study the plant oil was tested for fungicidal activity. This oil was found to be fungicidal to one or the other molds depending upon concentration [10].

Anticonvulsant activity

The ethanolic extract of *Nardostachys jatamansi* roots has been found to be effective in maximal electroshock seizure (MES) model at the dose of 400 mg/kg and in pentylenetetrazole induced seizure model at the dose of 200 mg/kg and 400 mg/kg in albino rats [11].

Antioxidant and Anticancer activity

Farhath Khanum et al studied antioxidant, biomolecule protective and cytoprotective properties of the plant extract. The plant extract significantly inhibited 2,2-azobis(2-methylpropionamide) dihydrochloride (AAPH)-induced oxidation of biomolecules [12]. The study by Shilpee Chaudhary et al showed that *Nardostachys jatamansi* methanolic fractions possess significant anti-proliferative potential which is mediated through cell cycle perturbation and pro-apoptotic effects in estrogen positive and estrogen negative breast carcinoma(MDA-MB-231)cells. Moreover, this study highlighted the antioxidant potential of *Nardostachys jatamansi* fractions which can be attributed to the presence of phenols [13]. Recently Snehal Suryavanshi et al estimated the activity of ethanolic extract of the plant on MYCN mediated regulation of expression of MDM2 and p53 proteins in neuroblastoma cell lines, IMR-32 and SK-N-MC. The result showed that the extract decreases the viability of neuroblastoma cells and it does not affect the viability of non-cancerous, HEK-293 cells. It causes dose-dependent alteration of the growth kinetics of the cancer cells. The extract hindered the expression of MYCN and MDM2 proteins with a simultaneously catalyzing the expression of tumor suppressor protein p53 [14].

Anti anxiety and antidepressant activity

V. Velpandian et al administered two dose levels of drugs (100mg/kg and 200mg/kg body weight) in mice for testing of anti-anxiety and antidepressant activity in three models namely Elevated plus maze model, Forced Swim test and Tail suspension test. The result concluded that plant extract possesses potent anti-anxiety and antidepressant effects and both the effects are apparently dose-dependent [15]. In another study, treatment with *Nardostachys jatamansi* ethanolic root extract of electron beam irradiated mice has shown significant reduction in the duration of immobility. This data suggested that expose too low levels of electron beam radiation can cause depression, which can be abolished by administration of *Nardostachys jatamansi* ethanolic root extract [16].

Anti-Parkinson's activity

Ahmad M et al induced Parkinson by injecting 6- hydroxydopamine (6-OHDA) which caused marked depletion of striatal dopamine content in rats. Consequently, the rats showed an increase in drug induced rotations and deficits in locomotors activity and muscular co-ordination. Then rats were treated with 200, 400 and 600 mg/kg of ethanolic extract of *Nardostachys jatamansi* roots for three weeks. The result was the significant restoration of dopamine content [17].

Anti-Diabetic activity

S. Nelson Kumar et al evaluated the anti-diabetic activity of ethanolic extract of *Nardostachys jatamansi* roots in alloxan induced diabetic rats for 7 days. The ethanolic extract at high dose (1200 mg/kg) was proved to have significant hypoglycemic effect in diabetic rats [18]. Another study by M. A. Aleem et al showed hydro-alcoholic extract of plant to improve different parameters associated with diabetes, like body weight, lipid profile and biochemical parameters. Extracts also found to cause improvement in regeneration of β -cells of pancreas in diabetic rats [19].

Antihypertensive activity

Mohd. Ashfaque et al studied antihypertensive activity of ethanolic extract of *Nardostachys jatamansi* at the doses of 10, 20 and 25 mg/kg body weight of dogs. The test drug produced significant fall in blood pressure in all doses indicating that the plant had antihypertensive effect against adrenaline induced hypertension [20]

Anti-ulcer activity

Syed Atiq ur Rahman and Syed Arshaduddin Ahmed studied effect of hydroalcoholic extract of the plant on pylorus ligation induced ulcer in rats. The drug at dose of 500mg/kg was found to significantly inhibit formation of ulcer [21].

Hepatoprotective activity

Hepatoprotective role of *Nardostachys jatamansi* has been studied by biochemical evaluation of liver enzymes using thioacetamide [22]. Increased levels of enzymes in response to thioacetamide were restored by using 50 % ethanolic extract of the plant roots.

Hair growth activity

Venkateswara Rao Gottumukkala et al performed in-vivo study in female Wistar rats for estimating the hair growth activity of crude extracts of *Nardostachys jatamansi*, its different fractions and isolated terpenoids (nardal, jatamansic acid, and nardin). The hair growth studies showed significant activities for the extract, fraction, and the isolated compounds [23].

Neuro-protective activity

Khan MB et al have studied the neuroprotective activity of certain natural antioxidants. Combined treatment with the extract of *Nardostachys jatamansi* (200 mg/kg), crocetin (25 μ g/kg) and selenium (0.05 mg/kg) as sodium selenite for 15 days improved behavioral outcomes in streptozotocin induced cognitive impairment in rats [24].

CONCLUSION

Nardostachys jatamansi has been in use for treatment of various pathological conditions for many years. It contains chemicals of various classes such as fixed oils, alkaloids, flavonoids, tannins, saponin, proteins and amino acids, carbohydrates, terpenoids, glycosides and lactones. Many of them are therapeutically important. Various researches have proved that the plant shows multiple therapeutic activities which include antibacterial and antifungal, anticonvulsant, antioxidant and anticancer, anti-anxiety and antidepressant, anti-Parkinson, anti-diabetic, anti-hypertension, antiulcer, hepatoprotective, hair growth and neuro-protective activity.

REFERENCES

1. Jain and Rao. An assessment of threatened plant of India. Proceedings of the seminar held in Dehradun, Botanical survey of India, Howrah, India. 1983.
2. Anon. Rare and endangered plant in china. Shanghai Education Press, Shanghai china. 1987.
3. ShresthaTB and Joshi RM. Rare Endemic and Endangered plant of Nepal.WWF Nepal Program, Kathmandu Nepal 1996.
4. Pradhan R. Annotation to WCMC plant list for Bhutan dated 31 august 1993.
5. Chauhan NS. Medicinal and aromatic plant of Himachal Pradesh. Indus Publishing Company Tagor Garden New Delhi. 1999; 426-28.
6. Anon. IUCN Analyses of Proposals to Amend the CITES Appendices, Prepared by IUCN Species Survival Commission and TRAFFIC Network for the Tenth Meeting of the Conference of the Parties to CITES. IUCN the World Conservation Union Gland Switzerland 1997.
7. Rekha K, Rao RR, Pandey R, Prasad KR, Babu KS, Vangala JR, et al. Two new sesquiterpenoids from the rhizomes of *Nardostachys jatamansi*. J Asian Nat Prod Res 2013;15:111-16.
8. Sharma N, Sharma AR, Patel BD, Shrestha K. Investigation on phytochemical, antimicrobial activity and essential oil constituents of *Nardostachys jatamansi* DC in different regions of Nepal. Journal of Coastal Life Medicine. 2016; 4(1):56-60
9. Mishra D, Chaturvedi RV, Tripathi SC. The fungitoxic effect of the essential oil of the herb *Nardostachys jatamansi* DC. Trop Agric.1995; 72:48-52
10. Sarbhoy AK, Varshney JL, Maheshwari ML, Saxena DBE. Isolation and activity of the sesquiterpene valeranone from *Nardostachys jatamansi* DC. Arzneimitteforschung 1978; 28(1):7-13

11. Purushotham K, Basavanna PL. Anticonvulsant profile of *nardostachys jatamansi* roots in albino rats. *International Journal of Basic & Clinical Pharmacology*. 2016; 5(3): 762
12. Razack S, Kumar KH, Nallamuthu I, Naika M, Khanum F. Antioxidant, Biomolecule Oxidation Protective Activities of *Nardostachys jatamansi* DC and Its Phytochemical Analysis by RP-HPLC and GC-MS. *Antioxidants* 2015;4:185-203.
13. Chaudhary S, Chandrashekar KS, Pai KSR, Setty MM, Devkar RA, Reddy ND et al. Evaluation of antioxidant and anticancer activity of extract and fractions of *Nardostachys jatamansi* DC in breast carcinoma, *BMC Complementary and Alternative Medicine* 2015; 15:50
14. Suryavanshi S, Raina P, Deshpande R, Ghanekar RK. *Nardostachys jatamansi* Root Extract Modulates the Growth of IMR-32 and SK-N-MC Neuroblastoma Cell Lines Through MYCN Mediated Regulation of MDM2 and p53. *Pharmacognosy Magazine*, 2017;13(49): 21–24
15. Velpandian V, Mohamed MM, Elangovan S, Anbu N. Evaluation of Anti-Anxiety and Anti-Depressant Activities of Sadamanjil Chooranam Extract (*Nardostachys Jatamansi*) In Mice. *Am. J. Pharm Health Res* 2014; 2(9):167- 76
16. Deepa B, Sucheta K, Rao S. Antidepressant activity of *Nardostachys jatamansi* in electron beam irradiated mice. *International Journal of Research in Ayurveda and Pharmacy*. 2013; 4(1):101-03
17. Ahmad M, Yousuf S, Khan B, Hoda MN, Ahmad MA, Ishrat T et al. Attenuation by *Nardostachys jatamansi* of 6-hydroxydopamine-induced parkinsonism in rats: behavioral, neurochemical, and immunohistochemical studies. *Pharmacol and Biochem Behav*. 2006; 83:150-60
18. Nelson KS, Reddy RK, Kanhere RS, Yasodha KJ, Raja RC, Mahesh KK. Anti diabetic Activity of Ethanolic Extract of *Nardostachys jatamansi* on Alloxan Induced Diabetic rat; *International Journal of Advances in Pharmaceutical Research*. 2011; 2(6):263-68.
19. Aleem MA, Syed AB, Mohammed T, Khan RA, Ahmed MF, Anjum A et al. Antidiabetic Activity of Hydroalcoholic Extracts of *Nardostachys jatamansi* in Alloxan-induced Diabetic Rats. *British Journal of Medicine & Medical Research*. 2014; 4(28): 4665-73
20. Ashfaque M, Ahmad N, Begum Z, Nasreen F. Evaluation of antihypertensive activity of Sumbul-utTib (*Nardostachys jatamansi*) in adrenaline induced dog's blood pressure. *Journal of Pharmacognosy and Phytochemistry* 2017; 6(1): 93-95

21. Rahman SA, Ahmed SA. Anti-ulcer activity of *Nardostachys jatamansi* against pylorous ligation induced gastric ulcer. *Sch. J. App. Med. Sci.*, 2016; 4(8E):3048-53.
22. Ali S, Ansari KA, Jafry MA, Kabeer H, Diwakar G. *Nardostachys jatamansi* protects against liver damage induced by thioacetamide in rats. *Journal of ethnopharmacology*, 2000; 71: 359-63.
23. Gottumukkala VR, Annamalai T, Mukhopadhyay T. Phytochemical investigation and hair growth studies on the rhizomes of *Nardostachys jatamansi* DC. *Pharmacogn Mag.* 2011; 7(26): 146–50.
24. Khan MB, Hoda MN, Ishrat T, Ahmad S, Khan M et al. Neuroprotective efficacy of *Nardostachys jatamansi* and crocetin in conjunction with selenium in cognitive impairment. *Neurol Sci.* 2012; 33(5):1011-20.



AJPHR is
Peer-reviewed
monthly
Rapid publication
Submit your next manuscript at
editor@ajphr.com / editor.ajphr@gmail.com