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REVIEW ARTICLE
PHYTOCHEMICAL ACTIVITIES AND PHARMACOLOGY OF HERBAL DRUG: *NARDOSTACHYS JATAMANSI*

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Abstract

India, being a rich country in terms of the natural remedies by herbs or the plant extract from golden eras. So, flowing the ancient practitioner's practice a base we found that the Nardostachys Jatamansi (N. jatamansi) was utilized as it showed potent neuroprotective, antidiabetic, anti-inflammatory and the most important one is the restorative activity of the plant. After all the potency validation through the literature the plant was taken further for the pharmacological evaluation by using different pharmacognosy extraction techniques applied for the Nardostachys Jatamansi extract to be processed according to the different literature libraries. For the extraction procedure, the most used plant parts are assorted rhizomes. Rhizome of Nardostachys Jatamansi is enriched with many chemical constituents showing potent pharmacological actions. So, our review article will take you through a short review about the N. jatamansi pharmacological application clinical uses in daily life and also as potent medication for various diseases.

Keywords: Phytochemical activities, Pharmacology of herbal drug, Nardostachys jatamansi.

Introduction

As the Asian population is increasing day by day in world. The Consumption of naturally derived medicine demand is increasing rapidly, as the Asian population is blessed with the knowledge of the natural plants in their Vedas by their forefathers in extent. But as the studies steped into 21'st century there was a classified branch made to look for the need and the research over the naturally derived medicine could be justified. The branch which deals in the combination of the study of natural products and pharmaceuticals in knows as pharmacognosy. The American Society of Pharmacognosy defines Pharmacognosy as the studies of the physical, chemical, biochemical and biological properties of herbal drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources. With the help of the vast data of the natural plant's medication given by some ancient physicians, we came across a plant which was being used in the medication of the ancient physicians prominently to cure many diseases. After our extensive review we got to the conclusion that plant name is Nardostachys jatamansi also called as spikenard or muskroot.

Nardostachys jatamansi are found in the various part of alpine in the north to sub alpines in India, at height of 5000 m. N. jatamansi has variety of pharmacological activities. This perennial drug, generally consist of two species i.e. Nardostachys jatamansi and Nardostachys chinensis which belong to the family Valarinaceae. Taxonomy of the plant cab is seen in Table 1.

Table1: Taxonomy of *Nardostachys Jatamansi*

Kingdom	**Plantae**
Class	Dipsacales
Division	Mangnoliophyta
Order	Mangnoliopsida
Family	Valerianaceae
Genus	Nardostachys
Species	Jatamansi

The rhizomes of N. jatamansi is collected as it contains the various chemical constituents which are responsible to show the therapeutic activities by acting as tonic, stimulant and antiseptic. It has antibacterial, antifungal, antiviral and antioxidant effects. Other treatment of this drug may include headache, excitement, menopausal symptoms, flatulence, epilepsy, fungal disease, hyperlipidemia and intestinal colic (Paudyal *et al.*, 2012; Amit *et al.*, 2009).

Generally, the flowers are found to be slightly blue or pink in dense cymes. The roots and its rhizomes are found to be short, thick, dark grey rhizomes crowned with reddish brown tufted fibrous which are used in ancient medications in different medicinal system. It is used as a good stimulant, antispasmodic, tonic, laxative and antiepileptic. Jatamansi has been traditionally used for the treatment of huge varieties of disorders targeting various biological systems of our body such as digestive system, circulatory system, nervous system, respiratory system, urinary system, reproductive system and skin diseases (Sahu *et al.*, 2016).

According to recent researches this drug has also paved its path in the field of cosmetics. It can be tropically applied in the case of burns and skin inflammation.

Some of the common names which are commonly used for the plant are explained in Table 2:

Table 2: Various common names of *N. Jatamansi*

Region	**Common Names**
Sanskrit	Jatamansi
Hindi	jatamansi , Bal-char
Bengali	Jatamansi
Marathi	Jatamanshi
Gujrati	jatamansi, kalichhad
Telugu, Kannad, Malayalam	Jatamanshi
Kashmiri	butijatt, kuklipot
Nepal	haswa, naswa, jatamasgi
Garhwali	Masi
Rest of the world	Muskroot, spikenard

History

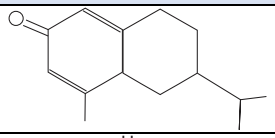
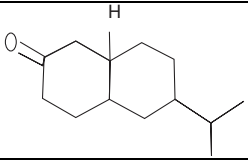
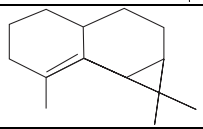
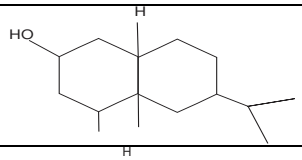
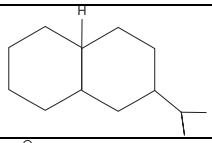
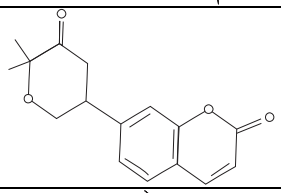
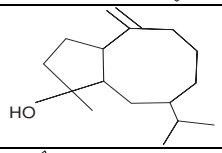
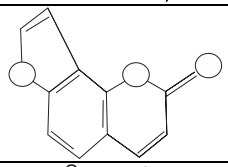
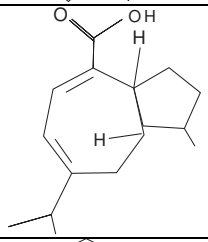
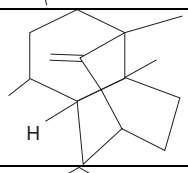
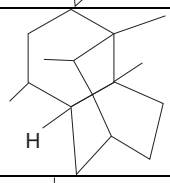
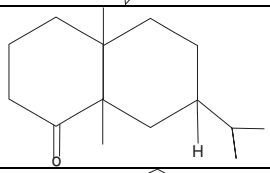
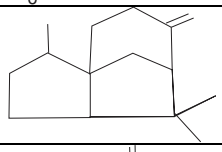
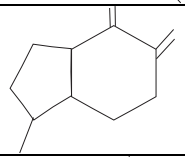
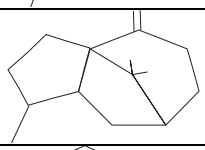
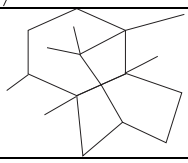
The 'Valeriana' word was discovered from the ancient manuscripts in of the ninth and tenth century (Evans *et al.*, 2008). The plant has played a vital role since Ayurvedic eras in Indian. It also served other medicinal system such as Unani in ancient Greek and Arab, and in ancient Egypt, Rome and Islamic scripts for its medicinal importance. N. jatamansi is also used to season foods in Medieval European cuisine, especially as a part of the spice blend used to flavour. Hippocrates used in sweetened and spiced wine drink (Singh *et al.*, 2013). The rhizomes of the plant were also used in Ayurvedic system of medicine as a bitter tonic, stimulant, antispasmodic, epilepsy and to treat hysteria (Jha *et al.*, 2012).

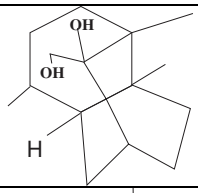
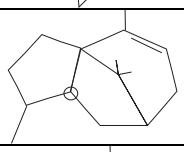
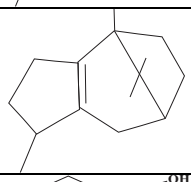
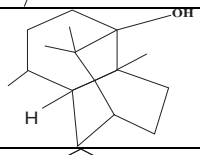
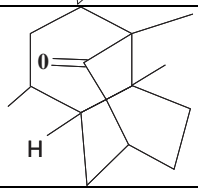
Phytochemical properties

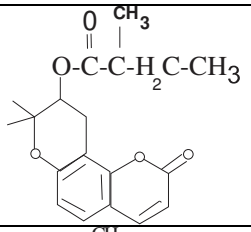
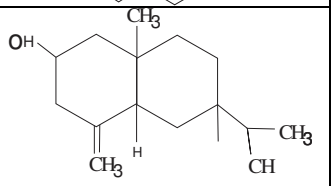
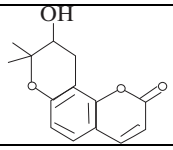
According to phytochemical studies, the plant roots contain various volatile oils such as sesquiterpenes, coumarins where, jatamansone is the main sesquiterpene. Other sesquiterpenes include jatamansic acid, jatamansinone, nardostachone, jatamansinol nardostachone, jatamol, nardostachyin, nardosinone, pyrnocoumarin A and B and sesquiterpene acid (Sharma *et al.*, 2016).

Nardostachys jatamansi comprise of following constituents yet the principle dynamic constituents include coumarins and sesquiterpenes, where, Jatamansone is a primary sesquiterpene. The different sesquiterpenes incorporates Alphapatcho-ulense, β-eudesemo, β-sitosterol, elemol, angelicin, jatamansin, jatamansinol, calarene, jatamansone β-atchoulense, n-hexaco-sanyl, n-hexacosane, Oroselol, valeranal, valeranone, seychelane, nardostachnol, nardostachone (Malik *et al.*, 2018). (+) unstable oil fundamental oil, gum, sugar, starch, severe extractive issue, gum, ketone, jatamansic corrosive, jatamansone, lupelol, Malliene, Calarenol, coumarinjatamansin, propionate, cyclohexanal ester, heptacosanyl pentanoate are confined from rhizomes, diethaniod bicyclicketone-nardostachone (Singh *et al.*, 2009). Many phytochemical examinations of Nardostachys jatamansi have depicted the nearness of steroids, alkaloids, sterols, tannins, adhesive, flavonoids, sugars, gums, terpenes and glycosides. Are also complied in the Table 3 giving brief about the phytochemical properties accompanied with elucidated structure (Rahman *et al.*, 2011). Such chemicals are hence useful in studying the various effects and factors on the skin.

Table 3 : The chemical constituents along with their chemical structures present in *N. Jatamansi.*

Chemical Constituents	Chemical Structures
Nardostachone	
Tetrahydronardostachone	
β - Maaliene	
Tetrahydronardostachol	
Tetrahydronardostachane	
Jatamansinone	
Nardol	
Angelcin	
Jatamansic Acid	
Seychellene	
Seychelane	
Valernanone	
β-Cedrene	
Tricyclovetivene	
Gama - Patchoulene	
Seychellanol	

Seychellanodiol	
Alpha - Patchoulene	
Beta - Patchoulene	
Patchouli alcohol	
Norseychellanone	

Dihydrojatamansin	
Jatamol A	
Jatamansonol	

Potent plant part

The rhizome of the N. jatamansi was collected from its wild species (Yoon *et al.*, 2018).

Table 4: Various medicinal mangemnet of the disease with the specific potent plant part of *Nardostachys Jatamansi*

S No.	Potent pant part	Disease management	References
1.	Rhizomes	Fatigue	You *et al.*, 2012
2.	Rhizomes	Antioxitant And Free Radicle Scavanger	Rücker *et al.*, 1978
3.	Essential Oil	Hair Growth And Blackness Of Hair	Moein *et al.*, 2017
4.	Rhizomes and Roots	Antineuro-Inflammatory	Madhu *et al.*, 2012
5.	Ethanolic Extract	Alzheimer's Disease	Madhu *et al.*, 2012
6.	Rhizomes	Protective Effect Of *Nardostachys Jatamansi* Against Radiation	Pandey *et al.*, 2017
7.	Rhizomes	Antimicrobial Activity	Bae *et al.*, 2012
8.	Rhizomes	Pancreatitis	Chaudhary *et al.*, 2015
9.	Rhizomes	Anticancer	Sahu *et al.*, 2016
10.	Essential Oil	Antifungal Activity	Ahmad *et al.*, 2006
11.	Roots	Anti-Parkinsons	Chopra *et al.*, 1954
12.	Rhizomes	Antispasmodic In Hysteria	Singh *et al.*, 2013
13.	Extract of Jatamasni	Antidiabetic Activity	Aleem *et al.*, 2014
14.	Plant	scorpion sting	Chopra *et al.*, 1954
15.	Ethanolic Extract	Hepatoprotective Activity	Purnima *et al.*, 2015

Adulterant

The major adulterants used are the rhizomes of *Selinum vaginatum*, containing volatile oil (Joshi *et al.*, 2006).

Mechanism of action

Nardostachys jatamansi increases levels of the following key neurotransmitters in the brain:

- GABA
- Norepinephrine
- Dopamine
- Serotonin
- 5-Hydroxyindoleacetic acid (5-HIAA)
- Nardostachys jatamansi inhibits inflammatory cytokines IL-1β, IL-6, and tumor necrosis factor alpha (TNF-α).
- Nardostachys jatamansi deactivates p38 mitogen-activated protein kinases (MAPKs), a class of enzymes involved in the inflammatory response to stress.

Biological activities of *Nardostachys jatamansi*

Antioxidant Activity

Jatamansi showed the antiperoxidative property when it was experimented on a rodant liver. They had seen in their various experiments and investigation that the concentrate gave security as well as high protection against lipid peroxidation. In another experimental examination aqueous concentrate of jatamansi roots were explored for its cancer prevention agent and anti-cataleptic impacts on a rodent model of the infection by estimating different physiological, social and biochemical parameters (Yoon *et al.*, 2018).

Anti-Neuroinflammatory Effects

N. jatamansi containing, two new chemical contituents i.e nardosinone-type sesquiterpenoids were detached from the concentrate of methanol. Desoxo-narchinol A and narchinol B essentially restrained lipopolysaccharides (LPS) initiated Nitric oxide and PGE2 generation in microglial cells. These results were identified with the hindrance of LPS incited articulation of iNOS and COX-2 chemicals in essential microglial cells after pre-treatment. The chemical mixtures however restrained the LPS initiated generation of chemically provocative cytokines, for example, various leukotrienes (IL-1b, IL-6) and TNF in microglial cells (Malik *et al.*, 2018).

Premenstrual Syndrome

N. jatamansi is an ancient medication that has shown antagonist effect against stress, sedation, anxiolytic, antispasmodic, tranquillizing, cardio-tonic and neuroprotective activities. N. Jatamansi has been shown in various studies to inhance the bio-genic amines and inhibitory neurotransmitters in brain. This mechanism entirely works by effecting the women hormones such as estrogen, progesterone, serotonin and gamma-aminobutyric acid (GABA) (Rao *et al.*, 2005).

Anticonvulsant and Neurotoxicity Profile

Nardostachys jatamansi considerably increased the input of seizures in an experimental model. The ethanol extract of jatamansi affected the generalized tonic-clonic seizures by showing very less neuro-toxic effect. The synergistic effect of Nardostachys jatamansi with combination with phenytoin showed a marked effect on the behavioral modifications and other potential activities on central nervous system (Sharma *et al.*, 2012).

Scavenging Activity

N. jatamansi was assessed when the ethanolic extract showed radical scavenging activities. The radicles of DPPH (2,2-diphenyl-1-picrylhydrazyl) were reacted with suitable reducing agents. These then undergo loss of coloration stoichiometrically and also the numbers of electrons consumed were measured by using spectrophotometry which was obsevered and determined which showed a significant antioxidant activity at 517nm (Lyle *et al.*, 2009).

Chronic Fatigue Syndrome

Administration of Nardostachys jatamansi extract (200 and 500 mg/kg) would in general standardize both by increasing the activities of peroxidation of lipids nitrite superoxide dismutase and also the levels of catalase. Nardostachys jatamansi extract [NJE] has an antioxidant effect. In a biochemical analysis, CFS (chronic fatigue syndrome) significantly increased the activities of peroxidation of lipids nitrite superoxide dismutase and also the levels of catalase. The outcomes of the experiment resulted in high oxidative pressure which was relieved by NJE. This indicated, its antioxidant property may be responsible for anti-stress effect (You *et al.*, 2012).

Anxiety and Insomnia

N. jatamansi added in this formulation due to its anti pshychotic activity and its prevention from various skin related disorders. It is also added in various classical Ayurvedic formulation widely prescribed for anxiety and insomnia. This example of such formulation is Sarpagandha ghanvati (Subashini *et al.*, 2007).

Cardiac Function

N. jatamansi is able to attenuate cardiac damage induced when 15mg/kg doxorubicin was introduced in experimental rats by the elevation of various. Serum marker enzymes. This prevented effect of enzymes which was mediated via anti-lipid peroxidation at the level of the cell membrane (Singh *et al.*, 1980).

Anti- Fungal Activity

Essential oil N. jatamansi showed anti-fungal properties against various fungal species such as Aspergillus flavus, Aspergillus niger and Fusarium oxysporum Mucor fragilis, Rhizopus stolonifera. The oil was found to show fungi static of fungicidal depending upon the amount concentration (Rücker *et al.*, 1978).

Anticancer Activity

N. jatamansi showed in vitro anti proliferative activity against two human cancer cell lines. The 95% extract of alcoholic had inhibitory effect for proliferation of neuroblastoma (Middleton *et al.*, 2000).

Hepatoprotective activity

Pre-treatment of rodents with 800 mg/kg of the rhizomes consisting of half ethanol concentrate of N. jatamansi is essential for reduction of the increased levels of serum transaminases and soluble phosphatase in thio-acetamide. This hepato-protective activity was determined by the standardization of different raised serum proteins which actuated liver toxicity (Ali *et al.*, 2000).

Antidiabetic action

The jatamansi concentrate has been proved beneficial for anti-diabetic activities. It reduces the levels of glucose in both non-diabetic as well as non-diabetic when contrasted with individual controls. When ethanolic extract was introduced at high portion, showed anti-diabetic action. The outcomes demonstrated that it has critical anti-hyperglycemic impact in trial models which are related to diabetes mellitus (Purnima *et al.*, 2015; Aleem *et al.*, 2014).

Neuroprotective activity

Various defensive impact of N. jatamansi on neurobehavioral exercises such as thiobarbituric corrosive receptive substances, diminished glutathione, thiol gathering catalase and sodium potassium ATPase exercises was considered in center cerebral supply route model of intense cerebral ischemia in rodents. Na [+] K [+] ATPase and catalase were declined essentially. The neuro conduct exercises [immediate engine action and engine co-ordination] seemed to be diminished. Experimental investigation gave viability of N. jatamansi, leading to central ischemia and hence resulted in cell reinforcement property (Salim *et al.*, 2003).

Nootropic movement

The raised in addition to labyrinth and the latent shirking worldview was utilized to assess the various parameters related to learning and memory. Various portions, mainly three, of an ethanol concentrate of N. jatamansi was directed for progressively seven days to both matured and young mice. The one portion of N. jatamansi fundamentally

improved the power of memory and learning in young mice. Furthermore, it switched and caused amnesia incited by diazepam at the another portion. When scopolamine related amnesia was switched, it was difficult to accept the fact that that the memory improvement might be a direct result of assistance of cholinergic transmission in the cerebrum. Thus, N. jatamansi may turn out to be a useful as memory therapeutic for the treatment of occurrence of dementia in aged population (Bhattacharya *et al.*, 1982; Joshi *et al.*, 2006). Some of the mentioned diseases are already using the potent drug for the medication and treatment in the combination for treating the disease. As some the uses are shown in the Fig 1.

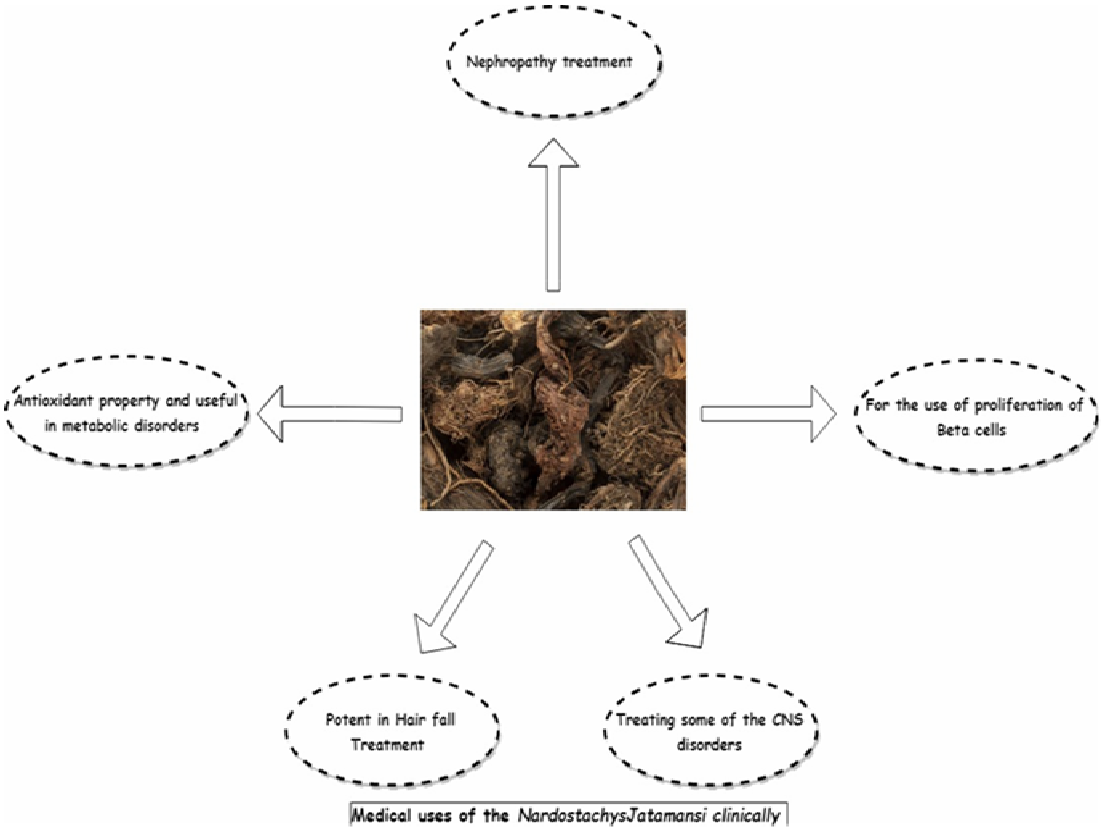


Fig. 1: Various potential uses of *Nardostachys Jatamansi* medication being practised.

Marketed formulations

Here is brief about some of the marketed formulation being marketed presently by the companies. Brief Can be seen in the Table 5.

Table 5: Various marketed formulation of *Nardostachys Jatamansi* in market in respect to its company.

S No.	Trade Name of the Preparation	Name of Marketted Product	Uses	Name of Manufactured Company
1.	Jatamansi	Kesh King	Hair Care And Hair Growth	Emami
2.	Jatamansi	Mentat	Mental Disorders	Himalaya
3.	Jatamansi	Ovarin	Ovarian Disorders	Ban Labs Ltd

Conclusions

Nardostachys Jatamansi is essential medicinal plant used to treat various diseases in Unani, Ayurveda & material medica medicine system. Preclinical studies have shown promising effect of Nardostachys Jatamansi as neuroprotective, antidiabetic, immunomodulaters, and anti-inflammatory properties. Present review elaborated the various pharmacological activities and phytoconstituents of Nardostachys Jatamansi, which required scientifically validation and serve the humanity for curative measures.

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Nil.

Conflicts of Interest:

There are no conflicts of interest.

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