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PHARMACOGNOSTIC AND PHARMACOLOGICAL INSIGHTS INTO JATAMANSI: AN AYURVEDIC WONDER HERB

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ABSTRACT: Himalayan herbs are a reservoir of natural diversity and cultural heritage, embodying a unique fusion of tradition and biodiversity. Among these botanical treasures, *Nardostachys Jatamansi*, commonly known as Jatamansi, holds a revered position in Ayurveda, the ancient Indian system of medicine. With roots tracing back thousands of years, Jatamansi has been esteemed for its multifaceted medicinal attributes. It plays a pivotal role in traditional Ayurvedic formulations and remedies, contributing to the holistic health of individuals. Jatamansi's applications in Ayurveda encompass the promotion of emotional and mental equilibrium, support for the nervous system, and the management of various health conditions. This review is dedicated to exploring the pharmacognostic and pharmacological potential of Jatamansi, a critical endeavor that not only validates age-old wisdom but also identifies bioactive constituents, evaluates safety and efficacy profiles, informs the development of herbal products, and fosters the harmonious convergence of traditional and contemporary healthcare systems. This pursuit of knowledge regarding Jatamansi contributes to a deeper understanding of its therapeutic properties and opens doors to its broader integration into modern medicine.

INTRODUCTION: The majestic Himalayan Mountain range, is home to a diverse array of medicinal and aromatic plants that have been cherished for their therapeutic and culinary properties for centuries. These Himalayan herbs represent a natural treasure, offering a unique blend of biodiversity and cultural significance [1, 2].

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Jatamansi, scientifically known as *Nardostachys Jatamansi* (NJ), is a perennial herbaceous plant native to the Himalayan region, particularly in Nepal, India, and Tibet. This herb belongs to the Valerianaceae family and is recognized for its potent medicinal properties.

Its historical use in Ayurveda, the ancient system of traditional Indian medicine, dates back thousands of years. Jatamansi is characterized by its long, slender rhizomes and tuberous roots, which are the most valued part of the plant for medicinal purposes. The plant grows at high altitudes, typically 3,000 to 5,000 meters above sea level.

It produces clusters of small pink or purplish flowers and aromatic roots. The roots, when dried, are often used in traditional Ayurvedic preparations [3].

Jatamansi (*Nardostachys Jatamansi*) is significant in Ayurveda, the ancient system of traditional Indian medicine. Its historical use dates back thousands of years, and it has been valued for its various medicinal properties. This herb has been a part of traditional Ayurvedic remedies and formulations, contributing to the overall well-being of individuals. Its uses in Ayurveda include promoting mental and emotional balance, supporting the nervous system, and addressing various health concerns [4-6]. Jatamansi has been traditionally used as a natural remedy for stress, anxiety, and mood disorders. It is considered an adaptogen, helping the body adapt to stress [6]. It is employed in Ayurveda to support heart health and regulate blood pressure [7]. Additionally, Jatamansi has been used to alleviate digestive issues, such as indigestion and flatulence. Moreover, in traditional Ayurvedic skincare, Jatamansi has been used to treat skin disorders, enhance skin complexion and it is believed to promote hair growth and improve hair quality. It has also been utilized for its potential anticonvulsant effects. Jatamansi is also traditionally used to promote sleep and manage insomnia [3]. *N. Jatamansi* contains a combination of volatile and non-volatile compounds. The volatile fraction is primarily composed of sesquiterpenes, whereas the non-volatile fraction consists mainly of sesquiterpenes, coumarins, lignans, neolignans, alkaloids, and steroids [8].

Reviewing the pharmacognostic and pharmacological potential of Jatamansi is significant as it validates traditional knowledge, identifies bioactive compounds, assesses efficacy and safety, informs the development of herbal products, and supports the integration of traditional and modern healthcare systems. This multidisciplinary approach is essential for maximizing the benefits of natural remedies like Jatamansi while ensuring their safe and effective use in contemporary healthcare [9-12]. Reviewing the pharmacognostic and pharmacological potential of Jatamansi is significant for several reasons, encompassing both traditional and modern perspectives. This review can help bridge the gap between traditional knowledge and modern science, offering a comprehensive understanding of the herb's therapeutic properties.

METHODS: Data search was accomplished by approaching PubMed, Google scholar, and ScienceDirect to include Clinical studies, meta-analyses, and reviews communicated in the English language. Search terms elaborated as Himalayan herbs, historical use of Jatamansi, antioxidant role of Jatamansi, indications of Jatamansi in various diseases, neuroprotective potential of Jatamansi, anxiolytic and sedative activity in Jatamansi , stress and anxiety relief with use of Jatamansi, Jatamansi in cognitive enhancement.

Phytochemistry: The therapeutic properties of *N. Jatamansi* are primarily associated with its rhizomes and roots, which have been the focus of extensive chemical investigations. These plant parts contain a diverse array of sesquiterpenes and coumarins. Notably, the sedative sesquiterpene valeranone is a major constituent of the essential oil extracted from the roots. Besides valeranone, other terpenoids identified in *N. Jatamansi* include spirojatamol, nardostachysin, jatamols A and B, as well as calarenol. Additionally, coumarins are present, with one of them being Jatamansin. The sesquiterpenes found in Jatamansi encompass nardostachone, dihydro Jatamansin, Jatamansinol, Jatamansic acid, Jatamansinone, Jatamansinol, oroseolol, oroselone, seselin, valeranal, nardostachysin, nardosinone, spirojatamol, jatamol A and B, calarenol, seychellene, seychelane, and coumarin (Jatamansin or xanthogalin). Furthermore, recent reports have indicated the discovery of a novel sesquiterpene acid called nardin and a unique pyranocoumarin known as 2', 2' – dimethyl - 3' – methoxy - 3', 4'-dihydro-pyranocoumarin [8, 13].

Medicinal Indications of *N. Jatamansi*:

Antioxidant Activity: In a preclinical study, the researchers the essential oil from Valeriana Jatamansior nardostachys Jatamansi, was thoroughly analysed through gas chromatography-mass spectrometry (GC-MS). They identified seven major components in the essential oil, which included β-vatirenene, β-patchoulene, dehydroaromadendrene, β-gurjunene, patchoulic alcohol, β-guaiene, and α-muurolene. Additionally,

the researchers further prepared and analysed methanolic, aqueous, and chloroform extracts from the roots of Valerian Jatamansi to determine their content of polyphenols and flavonoids. The antioxidant activity of root extracts was assessed using tests like DPPH radical scavenging and chelation power. Specifically, the methanolic extract exhibited notable antioxidant activity attributed to its high polyphenol and flavonoid content. The essential oil derived from Valeriana *N. Jatamansi* roots demonstrated moderate antioxidant activity [14].

Similarly, other preclinical evidence aimed to assess the anti-stress effects of a 70% hydro-ethanolic extract of rhizomes obtained from *N. Jatamansi* and its relationship with its antioxidant properties. The study involved Wistar rats divided into four groups: a "naïve" group, a "stressed" group, and two groups exposed to stress, with prior oral administration of *Nardostachys Jatamansi* extract (NJE) at doses of 200 mg/kg and 500 mg/kg. Stress was induced by subjecting the rats to 4 hours of restraint in metallic chambers at 4ºC. After this stressor, the rats were examined, and various biochemical parameters were analyzed. These parameters included lipid peroxidation (LPO) and nitric oxide (NO) levels in the stomach, LPO, NO levels, and catalase activity in the brain, plasma corticosterone levels, and ascorbic acid levels in the adrenal glands.

The study also investigated the *in-vitro* antioxidant activity of NJE by assessing its ability to scavenge free radicals. The results indicated that NJE displayed potent antioxidant properties. It significantly countered the stress-induced elevation of LPO and NO levels, and the reduction in catalase activity in the brain. Furthermore, NJE inhibited the occurrence of gastric ulcers and reversed the changes in biochemical parameters associated with stress-induced gastric ulceration [15]. The study revealed that methanolic fractions exhibited strong antioxidant properties. Importantly, there was a significant negative correlation (R = -0.9680) between the phenolic content and (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) (ABTS) scavenging, indicating that as phenolic content increased, ABTS scavenging improved. However, the correlation between phenolic content and total antioxidant capacity, which had a positive correlation (R = 0.8396), was not statistically significant. The ABTS scavenging correlation was statistically significant ($P < 0.05$), while the total antioxidant capacity correlation was not ($P > 0.05$) [16].

Anti-Alzheimer Activity: A preclinical setup investigated the potential of *N. Jatamansi* to enhance cognitive function. It is thought to improve memory and cognitive performance, although the mechanisms behind this effect are not fully understood [17]. It is believed to protect neurons from oxidative stress and inflammation, which can contribute to various neurodegenerative conditions [18]. Another study examined the neuroprotective effects of NJ in Alzheimers Disease (AD). The researchers used the ethanolic extract of NJ root against Aβ toxicity in cell cultures and in a Drosophila model. Chlorogenic acid, an active in the ethanolic extract of NJ root countered Aβ-induced cell death. In Drosophila, NJ extract improved survival, pupariation rate, and locomotor function, while reducing glial cells, reactive oxygen species, ERK phosphorylation, and nitric oxide. This suggests that NJ's neuroprotective benefits may result from its antioxidant, anti-inflammatory properties, and ERK inhibition, making it a potential treatment option against Alzheimer's disease [19].

Anxiolytic and Sedative Effects: The ethanolic root extract effectively mitigated depression and anxiety symptoms as assessed by the force swim test, tail suspension test, actophotometer, and elevated plus maze (EPM) in a preclinical animal model [20]. In another preclinical study mice were treated with *N Jatamansi* extract (NJE) for 7 days displayed increased time spent in open arms during the EPM test, more line crossings in the open field test, extended time spent in the lit compartment in the light-dark box test, as well as an elevated number of licks and accepted shocks in Vogel's conflict test, akin to the effects of diazepam. Additionally, a significant rise in monoamine neurotransmitter and gamma-aminobutyric acid (GABA) levels in the brain, and enhanced antioxidant enzyme activities were noted. Interestingly, when NJE was co-administered with flumazenil (a GABA-benzodiazepine antagonist) or picrotoxin (a GABAA gated chloride channel blocker), the anxiolytic actions of NJE were

significantly blocked or antagonized. This manifested as a substantial reduction in the time spent in open arms in the elevated plus maze test, a decrease in the number of line crossings in the open field test, and a decline in the number of accepted shocks and licks in Vogel's conflict test. These findings suggest that the anxiolytic effects of NJE are likely mediated through the activation of the GABAergic receptor complex [21].

A study investigated the sedative and sleep-inducing effects of valerian and hypericum extracts. Valerian rhizome was subjected to extraction using chloroform: methanol (70:30) to obtain a total extract. Female rats were divided into different groups and administered valerian extracts at doses of 100 mg/kg, 200 mg/kg, 400 mg/kg, and hypericum extracts at doses of 250 mg/kg, 500 mg/kg, with a control group receiving dimethyl sulfoxide (DMSO) (at the same volume) 15 minutes before the sedative and sleep evaluation. Sleep induction was done through intraperitoneal injection of ketamine at a dose of 40 mg/kg. Notably, the extract of valerian at a dose of 200 mg/kg, when compared with hypericum at a dose of 500 mg/kg, exhibited significant anesthetic or sedative effect [22].

Antidepressant Activity: Some preclinical studies suggest that N. Jatamansi ethanolic extract has antidepressant potential. It is thought to influence the levels of neurotransmitters like serotonin and dopamine, which play a crucial role in mood regulation [23]. Similarly, another study evaluated antidepressant effects and serotonin transporter (SERT) activity. The total methanol extract of NJ demonstrated significant antidepressant effects, as determined through the tail suspension test (TST) and open field test (OFT). Through ultra-high-performance liquid chromatography (UHPLC) analysis, the total extract was found to have an EC50 (half maximal effective concentration) of 31.63 µg/mL for enhancing SERT activity. Preparative high-performance liquid chromatography (p-HPLC) divided the total extract into twenty subfractions, and the 'subfraction-SERT activity' relationship curve highlighted that fraction NJFr.01 was enriched with SERT-enhancing compounds. Both the total extract and fraction NJFr.01 significantly ameliorated SERT activity [24]. A preclinical study assessed the antidepressant potential of the methanolic extract of *N Jatamansi* (MENJ). The study outcome demonstrated that MENJ, at doses of 200 and 400 mg/kg orally, produced a significant ($P<0.001$) antidepressant-like effect in both normal and sleep-deprived mice as determined by the TST and Forced Swimming Test (FST). Importantly, the efficacy of MENJ was comparable to that of imipramine (10 mg/kg orally). Notably, MENJ did not induce significant changes in the locomotor functions of mice when compared to the normal control group. However, it did significantly ($P<0.01$) ameliorated locomotor activity in sleep-deprived mice, effectively restoring it to levels comparable to those of normal control mice. These findings suggest that MENJ exhibits an antidepressant activity and holds promise as a treatment option for individuals experiencing depression linked to sleep disturbances [25]. Additionally, other preclinical studies on the administration of the hydroalcoholic extract of rhizomes of N Jatamansi exhibited a dose-dependent increase in the number of rotations during the (FST). This test, which took place in a glass jar, also revealed a statistically significant reduction in immobility.

For mice, the administration of NJHE resulted in a dose-dependent and statistically significant reduction in immobility time, swimming time, and climbing activity during the forced swimming test. Notably, when combined with fluoxetine, a significant difference in the results was observed, indicating a potential synergistic antidepressant effect. In the context of locomotor activity tests conducted in mice, none of the test drugs showed a significant increase or decrease in locomotor activity [26].

Anticonvulsant Activity: Some research suggests that Jatamansi may possess anticonvulsant properties, making it potentially useful in the management of epilepsy and seizure disorders [27]. A preclinical study finding revealed that valepotriate isolated from *N. Jatamansi* exhibited significant anti-epileptic effects against both maximal electroshock-induced seizures (MES)- and pentylenetetrazole (PTZ)-induced epileptic conditions when administered at doses of 5, 10, and 20 mg/kg. The effective dose for reducing seizures in MES and PTZ models was calculated to be 7.84 and 7.19 mg/kg, respectively. Additionally,

valepotriate at doses of 10 and 20 mg/kg significantly ameliorated the sleep duration and mitigated the sleep onset time for mice in the pentobarbital sodium-induced sleep test. Furthermore, valepotriate at doses of 5, 10, and 20 mg/kg notably enhanced the expression of GABAA receptors, glutamic acid decarboxylase65 (GAD65), and B Cell Lymphoma-2 (Bcl-2), while reducing the expression of caspase-3 in the brain. However, it did not have a significant impact on the expression of GABAB receptors [28]. Another studycompared the anti-epileptic effects of two substances: phenytoin sodium and an ethanolic extract of Jatamansi when combined with phenytoin sodium. Theresearchers used pentylenetetrazol (PTZ) seizure model and maximal electroshock seizure (MES) model for induction of seizures in mice. Interestingly, the combination of Jatamansi extract and phenytoin sodium produced more favourable results in terms of anti-epileptic effects than phenytoin sodium alone [29].

Antiparkinson's Activity: Another study demonstrated the activity of Jatamansi against Parkinson's disease (PD). In this study, comparative antioxidant and antiparkinsonian effect of hydroalcoholic extract of Nardostachys jatamansi *Mucuna pruriens* (HENJ) and (HEMP) was studied. The study revelaed that a mixture of 30 and 100 mg/kg of NJ demonstrated highly significant improvements in conditions induced by haloperidol (catalepsy), reserpine (hypolocomotion), and tacrine (vacuous chewing movements, orofacial burst, and tongue protrusion) when compared to the effects of Jatamansi hydroalcoholic. The hydroalcoholic extract of Jatamansi exhibited significant improvements in a dose-dependent manner. N Jatamansi hydroalcoholic extracts displayed free radical scavenging activity in DPPH and hydrogen peroxide (H2O2) assays. In the DPPH assay, the IC50 values for ascorbic acid, HENJ, HEMP, and the 1:1 mixture were 18.15, 50, 211.54, 114.85, and 109.12 µg/ml, respectively. In the H2O2 assay, the IC50 values were 28.58, 146.58, 98.18, and 179.47 µg/ml, respectively [30]. A comprehensive study provides substantial evidence to support the hypothesis that nardosinone, a compound found in the roots and rhizome of N Jatamansi can alleviate motor and cognitive symptoms in an animal model of Parkinson's disease. The regulation of Dopamine receptor (DRD2) expression appears to be a critical mechanism by which nardosinone exerts its therapeutic effect. These findings not only contribute to our understanding of the potential anti-PD properties of nardostachys but also suggest a promising avenue for the development of future treatments for Parkinson's disease. Nevertheless, further research is necessary to validate these findings and explore the potential clinical applications of nardostachys and nardosinone in human PD patients [31]. Other study revealed that the hydro-alcoholic root extract of N. Jatamansi was remarkably effective in reversing the Parkinsonism induced by haloperidol. This effect was statistically significant ($p < 0.01$) when compared to the reference drugs, a combination of L-dopa and Carbidopa (100mg+25mg/kg). These outcomes suggest that N. Jatamansi's hydro-alcoholic root extract possesses a notable capacity to counteract the Parkinsonian symptoms induced by haloperidol, potentially offering an alternative or complementary therapeutic approach. These findings revealed the potential value of N. Jatamansi as a source of neuroprotection [32].

Hematanic Activity: A preclinical study revealed hematinic potential of ethanolic extract of roots of Jatamansi. Twenty-four male albino Wistar rats were divided into four groups. Group I served as the control. Groups II, III, and IV received *N Jatamansi* extract orally at doses of 100 mg/kg, 200 mg/kg, and 400 mg/kg for 15 days. Blood samples were collected and analyzed for various parameters, including RBC and WBC counts, hemoglobin levels, thrombocyte count, and hematocrit, over 15 days using an automated analyzer. Body weight was also recorded regularly. The results indicated a significant increase in all parameters in the treated groups, with no significant change in body weight [33].

Antimicrobial and Antifungal Activity: A study investigated the volatile constituents in *N Jatamansi* (hydrodistilled) rhizomes and their antimicrobial potential. Using Gas Chromatography (GC) and Gas Chromatography-Mass Spectroscopy (GC-MS), 10 compounds were identified, with Calarene (20.4%), γ-Himachelene (17.1%), and Vardiflorene (12.3%) as major constituents. The volatile oil exhibited significant

antimicrobial activity against various microorganisms, especially at 1% concentration. These findings suggest the potential of these constituents for developing antimicrobial agents, warranting further research for a comprehensive understanding and clinical applications [34]. Similarly, another study investigated the antifungal potential of roots of *N Jatamansi* against both Multi Drug Resistant (MDR) and ATCC fungal strains. Using a 70% ethanolic extract, the study employed disc diffusion and Minimum Inhibitory Concentration (MIC) testing. The extract demonstrated the effectiveness with MIC values ranging from 2.77 to 12.24 mg/mL against MDR and ATCC strains. The 70% ethanolic extract of *N. Jatamansi* revealed promising antifungal activity, offering potential life-saving benefits for critically ill patients [35]. Another study aimed to evaluate the antifungal potential of essential oils and crude extracts from aromatic plants against Fusarium rot in *Trichosanthes dioica*. The outcome demonstrated *Valeriana Jatamansi* (hydrodistilled) exhibited fungitoxicity at 10 and 100 µl/ml concentrations and acted as a mycelial growth inhibitor [36].

Cardioprotective and Hypolipidemic Activity: A pre-clinical study evaluated the effects of a 50% ethanolic extract of *N. Jatamansi* (whole plant) on cholesterol levels. The extract showed an increase in both the HDL-cholesterol/total cholesterol ratio, which is beneficial for heart health. Additionally, the extracts reduced the total cholesterol/phospholipids ratio [37]. In a study, the researchers aimed to assess the effects of *N. Jatamansi* rhizome ethanolic extract on doxorubicin-induced myocardial injury in Wistar albino rats, specifically regarding lipid metabolism. Doxorubicin is known to have cardiotoxic effects due to its inhibition of fatty acid oxidation in the heart. Rats treated with doxorubicin displayed increased serum and cardiac lipids, including cholesterol, triglycerides, free fatty acids, and phospholipids, as well as alterations in lipoprotein levels. However, pretreatment with *N. Jatamansi* extract for seven days showed significant improvements in lipid profiles and lipid-metabolizing enzymes. This suggests that *N. Jatamansi* may protect against doxorubicin-induced myocardial injury through its anti-lipid peroxidative properties [38].

Additionally, a similar study aimed to assess the hypolipidemic and cardioprotective effects of hydroalcoholic (ethanol and water) extract from roots of *N. Jatamansi* in animals administered with isoproterenol and triton WR 1339. In the isoproterenol-treated group, pretreatment with 50 mg/kg of *N. Jatamansi* showed promising antioxidant and hypolipidemic activity, though minor changes in cardiac markers were observed, suggesting a need for a higher dose. In triton WR 1339-induced hyperlipidemic rats, administration of 1000 mg/kg of the extract for seven days demonstrated significant hypolipidemic activity [39].

Another study explored the impact of doxorubicin-induced cardiomyopathy and the potential cardioprotective effects of *N. Jatamansi*. Doxorubicin, while effective in cancer treatment, can lead to cumulative cardiac damage due to increased oxidative stress, particularly through redox cycling on mitochondrial complex 1. Rats treated with doxorubicin exhibited compromised mitochondrial function, lysosomal enzyme alterations, membrane-bound phosphatase changes, and myocardial damage, as evident in ultrastructural changes. However, pretreatment with ethanolic root extracts of *N. Jatamansi* (at 500 mg/kg body weight, orally for seven days) mitigated these abnormalities, preserving mitochondrial respiration, lysosomal integrity, membrane-bound phosphatases, and myocardial ultrastructure. These findings suggest that *N. Jatamansi* cardioprotective efficacy may be mediated through its antioxidant effects and the attenuation of oxidative stress, offering promise for its potential application in reducing doxorubicin-induced cardiac damage [40].

Anticancer Activity: The methanolic fractions were found to have noteworthy anti-proliferative properties, which were achieved through disrupting the cell cycle and promoting pro-apoptotic effects in MDA-MB-231 cells. Additionally, this research emphasizes the antioxidative capacity of *N Jatamansi* methanolic fractions, and this antioxidative potential is likely associated with the presence of phenolic compounds [16]. Additionally, an *in-vitro* study highlighted the promising anti-cancer properties of valtrate, particularly in human breast cancer cells. Valtrate demonstrated significant anti-cancer effects *in-vitro*, with

minimal harm to normal human breast epithelial cells (MCF 10A). Its mechanism of action includes inducing cell cycle arrest at the G2/M stage and apoptosis in MDA-MB-231 and MCF-7 cell lines. This was associated with reduced expression of key proteins like p-Akt (Ser 473), cyclin B1, and caspase 8, along with increased expression of p21, p-cdc2, cleaved-caspase 3, cleaved-caspase 7, and poly (ADP-ribose) polymerase (PARP). Furthermore, valtrate exhibited the ability to inhibit cell migration by down-regulating of MMP-9 and MMP-2 expression. These findings underscore the potential of valtrate as a valuable antitumor agent in the context of breast cancer therapy [41]. In another study from China, the compound nardoguaianone L (G-6) was extracted from *N. Jatamansi* and exhibited inhibitory effects on SW1990 pancreatic cancer cells, including colony formation and cell migration, while promoting apoptosis. Quantitative proteomics revealed that G-6 influenced the expression of 143 proteins related to various biological processes, cellular components, and molecular functions. Additionally, Kyoto Encyclopedia of Genes and Genomes (KEGG) analysis highlighted the Human T-cell leukemia virus pathway as significantly impacted. Notably, the MET/PTEN/TGF-β pathway emerged as a key player, regulating cell migration and motility. In conclusion, G-6 demonstrates promise as a potential anti-pancreatic cancer agent with its influence on the MET/PTEN/TGF-β pathway [42].

Antidiabetic Activity: A preclinical study aimed to evaluate the anti-hyperglycemic potential of hydroalcoholic extracts from *N. Jatamansi* rhizomes in alloxan-induced diabetic rats. The hydroalcoholic extract HAE1 (at 500mg/kg) demonstrated significant antihyperglycemic activity compared to HAE2 (at the same dose) in diabetic rats. These extracts also improved various parameters associated with diabetes, including body weight, lipid profile, and biochemical parameters. Additionally, histopathological studies indicated the potential of these extracts to promote the regeneration of β-cells in the pancreas, suggesting a mechanism for their anti-diabetic activity [43].

Another study investigated the anti-diabetic mechanism of NJE (hydrodistilled). Streptozotocin-induced diabetic mice exhibited hyperglycemia and hypoinsulinemia, which was effectively mitigated by NJE. The protective effect of NJE was associated with the suppression of nuclear factor (NF)-κB activation and protection against cytokine-induced cytotoxicity. Additionally, NJE reduced NF-κB activation, inducible nitric oxide synthase expression, and nitric oxide production in RINm5F cells and islets. These findings support the potential of NJE in preventing diabetes-related hyperglycemia and hypoinsulinemia through NF-κB inhibition and protection against cytokine-induced cytotoxicity [44]. In another study, the impact of ethanolic decoction of *N. Jatamansion* insulin sensitivity and hepatic glucose production was evaluated in a type 2 diabetes animal model. C57BL/KsJ-db/db mice were categorized into three dietary groups: control, NJE, and rosiglitazone. After a 6-week intervention, NJE significantly reduced blood glucose, glycosylated hemoglobin, and improved insulin sensitivity. NJE also lowered plasma lipids, increased AMP-activated protein kinase activity, and enhanced glucose transporter expression in skeletal muscle. Additionally, it mitigated gluconeogenesis in the liver. These findings underscore the potential of NJE in mitigating hyperglycemia by enhancing insulin sensitivity and curbing hepatic glucose production. [45].

TABLE 1: COMPONENTS AND UTILIZATION OF *N. JATAMANSI*

Parts of N. Jatamansi	Extracts used	Indication	References
Roots	Methanolic, aqueous and chloroform	Antioxidant	[14]
Rhizomes	Ethanolic	Antioxidant	[15]
Roots and rhizomes	Petroleum ether, methanolic extract, diethyl ether, ethyl acetate and aqueous	Antioxidant and Anticancer	[16]
Roots	Ethanolic	Neuroprotective, anxiolytic and sedative	[19] [20]
Rhizomes	Chloroform + methanol	Anxiolytic and sedative	[22]
Roots	Ethanolic	Antidepressant	[23]
Roots and rhizomes	Methanolic	Antidepressant	[24]

Rhizomes	Methanolic	Antidepressant	[25]
Rhizomes	Hydroalcoholic	Antidepressant	[26]
Roots	Ethanolic	Anticonvulsant	[28]
Roots and rhizomes	Ethanolic	Anticonvulsant	[29]
Roots	Hydroalcoholic	Antiparkinson's	[30]
Roots and rhizomes	Ethanolic	Antiparkinson's	[31]
Roots	Hydroalcoholic	Antiparkinson's	[32]
Roots	Ethanolic	Hematanic activity	[33]
Rhizomes	Hydrodistilled	Antimicrobial	[34]
Roots	Ethanolic	Antifungal	[35]
Whole plant	Ethanolic	Cardioprotective and hypolipidemic activity	[37]
Rhizomes	Ethanolic	Cardioprotective and hypolipidemic activity	[38]
Roots	Hydroalcoholic (ethanol and water)	Cardioprotective and hypolipidemic activity	[39]
Roots	Ethanolic	Cardioprotective and hypolipidemic activity	[40]
Roots and rhizomes	Methanolic	Anticancer	[16]
Rhizomes	Hydroalcoholic	Antidiabetic activity	[43]
Rhizomes and roots	Hydrodistilled	Antidiabetic activity	[44]
Rhizomes and roots	Ethanolic decoction	Antidiabetic activity	[45]
Rhizomes and roots	Hydrodistilled	Antidiabetic activity	[46]

TABLE 2: COMPONENTS AND UTILIZATION OF *N. JATAMANSI*

Parts of N. Jatamansi	Extracts Used	Indication	References
Roots	Methanolic, aqueous and chloroform	Antioxidant	[14]
Roots	Ethanolic	Neuroprotective	[19]
Roots	Ethanolic	Anxiolytic and sedative	[20]
Roots	Ethanolic	Antidepressant	[23]
Roots	Ethanolic	Anticonvulsant	[28]
Roots	Hydroalcoholic	Antiparkinson's	[32]
Roots	Ethanolic	Hematanic activity	[33]
Roots	Hydroalcoholic	Antiparkinson's	[30]
Roots	Ethanolic	Antifungal	[35]
Roots	Hydroalcoholic (ethanol and water)	Cardioprotective and hypolipidemic activity	[39]
Roots	Ethanolic	Cardioprotective and hypolipidemic activity	[40]
Rhizomes	Ethanolic	Antioxidant	[15]
Rhizomes	Chloroform + methanol	Anxiolytic and sedative	[22]
Rhizomes	Methanolic	Antidepressant	[25]
Rhizomes	Hydroalcoholic	Antidepressant	[26]
Rhizomes	Hydrodistilled	Antimicrobial	[34]
Rhizomes	Ethanolic	Cardioprotective and hypolipidemic activity	[38]
Rhizomes	Hydroalcoholic	Antidiabetic activity	[43]
Roots and rhizomes	Petroleum ether, methanolic extract, diethyl ether, ethyl acetate and aqueous	Antioxidant and Anticancer	[16]
Roots and rhizomes	Methanolic	Antidepressant	[24]
Roots and rhizomes	Ethanolic	Anticonvulsant	[29]
Roots and rhizomes	Ethanolic	Antiparkinson's	[31]
Roots and rhizomes	Methanolic	Anticancer	[16]
Rhizomes and roots	Hydrodistilled	Antidiabetic activity	[44]
Rhizomes and roots	Ethanolic decoction	Antidiabetic activity	[45]
Rhizomes and roots	Hydrodistilled	Antidiabetic activity	[46]
Whole plant	Ethanolic	Cardioprotective and hypolipidemic activity	[37]

Clinical Study Evidence: A clinical study from recent years investigated the effectiveness of *N. Jatamansi* in reducing blood pressure among hypertensive patients. A single-blind randomized, placebo-controlled study involved 40 participants aged 35-70 years, with stage 1 hypertension and using up to two antihypertensive drugs. Over a 4-week period, participants received either *N. Jatamansi* (3 g daily) or a placebo. Blood pressure measurements and MINICHAL scores for quality of life were recorded at baseline and the end of the trial. The study outcome showed a significant

reduction in average systolic and diastolic blood pressure in the *N. Jatamansi* group, while there was no significant change in the placebo group. Specifically, systolic blood pressure decreased from 144.20 mmHg to 134.30 mmHg, and diastolic blood pressure decreased from 94.9 mmHg to 83.10 mmHg in the *N. Jatamansi* group. Spanish Hypertension Quality of Life Questionnaire (MINICHAL) scores also significantly improved in the N. *Jatamansi* group. These findings indicate that *N. Jatamansi* is effective in reducing blood pressure in essential hypertension. Further research is needed to optimize dosages and treatment duration for this herbal remedy [47].

Another clinical investigation explored the clinical efficacy of an anxiolytic compound prescription containing *Valerianae Jatamansi Rhizoma* et Radix (ACPV) for treating generalized anxiety disorder (GAD) characterized by liver qi stagnation and a sense of unease. The study involved 60 patients, randomly assigned to either the ACPV treatment group or the control group receiving deanxit. Both groups received treatment for 4 weeks. Assessments included the Hamilton Anxiety Rating Scale (HAMA) scale, traditional Chinese medicine (TCM) symptom scale, salivary cortisol levels, life events scale (LES), and drug safety evaluation. The outcome indicated a significant reduction in HAMA scores, improved TCM syndrome scores, and decreased salivary cortisol levels in both groups after 2 and 4 weeks of treatment. No statistically significant differences were observed between the two groups regarding these parameters. However, the treatment group exhibited a significantly lower incidence of adverse reactions compared to the control group, highlighting the safety of ACPV. In conclusion, ACPV appears to be effective in treating GAD characterized by liver Qi stagnation and a sense of unease, with a favourable safety profile [48].

Another clinical trial aimed to assess the efficacy of 'ward' vaginal tablets, containing Rosa damascena, *Punica granatum* L., *Querqus infectoria* Oliv., *Myrtus communis* L., and *N. Jatamansi* in alleviating the symptoms of vulvovaginal candidiasis. The study employed a parallel, double-blinded, placebo-controlled approach, with 46 participants in both the 'ward' and placebo groups. The 'ward' group received the 'ward' vaginal tablet, while the placebo group received a placebo for 7 consecutive nights. Results showed that two weeks after treatment, a significant number of patients in the 'ward' group (63.045%) had negative culture results for candidiasis compared to the placebo group (13.04%). Furthermore, clinical symptoms, including itching, irritation, and vaginal discharge, were significantly reduced in the 'ward' group in comparison to the placebo group both during and after the intervention [49].

Another clinical study involving 40 newly diagnosed patients with Diabetes mellitus. The study implemented a treatment regimen involving the use of *Jatamansi churna*, an herbal remedy, in conjunction with Shirodhara, a traditional Ayurvedic therapy, for a period of 21 days. Assessment of the patients' blood sugar levels was conducted both before and after the treatment period. The results of the study indicated a significant improvement in blood sugar levels following the treatment regimen. This suggests that the combination of *Jatamansi churna* and Shirodhara may hold promise in managing blood sugar levels in patients with newly diagnosed Diabetes mellitus. However, it is important to note that more extensive research and clinical trials are needed to validate and further understand the efficacy and safety of this treatment approach [50].

CONCLUSION: *N Jatamansi*, a traditional medicinal herb, shows promising indications in the management of various diseases. Its versatile therapeutic properties have been explored in studies across different medical domains. From its potential use in reducing blood pressure in hypertensive patients to its effects on improving symptoms in generalized anxiety disorder and diabetes management, Jatamansi exhibits a wide range of beneficial applications. The present review suggest that Jatamansi may hold promise in addressing health concerns such as hypertension, anxiety, and diabetes. However, further research and clinical trials are needed to establish its safety and efficacy conclusively in these and other conditions. With its rich history in traditional medicine, *N Jatamansi* presents an intriguing avenue for exploring novel treatments and complementary therapies in the modern healthcare landscape.

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