

## Collection practices of himalayan medicinal plants (*Nardostachys Jatamansi*): Ancient, ayurvedic, traditional and present application

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### Abstract

*Nardostachys jatamansi* from the major natural resources base of the Indian indigenous health care tradition, the medicinal value of drug plant is due to the presence of some chemical substances in the plant tissues which produce a definite physiological action on living biological body. *Jatamansi* plants synthesize hundreds of chemical compounds for functions including defense against insects, fungi, diseases, and herbivorous mammals. Due to the global popularity of Ayurveda, there is a constant increase in demand for herbal drugs in the last few decades thus exerting huge pressure on natural resources. According to modern science, drugs possess highest potential during its collection period. The climate temperature, soil conditions, rainfall, duration of daylight, altitude, methods of cultivation, collection from the wild area, effect of lunar cycle, and methods of collection, processing, and storage have an impact on the secondary metabolites of the plant ultimately which affect the therapeutic efficiency of the drug.

**Keywords:** *nardostachys jatamansi*, collection practices, ayurveda, lunar cycle, chemical constituents

### Introduction

*Nardostachys jatamansi* DC, a critically endangered rhizome-bearing medicinal plant, is restricted to specialized habitats in high altitudes of the Himalaya, ranging from 3000 to 5000 m asl. The plant is collected from natural habitats for local consumption and trade (S. airi *et al.*, 2000) [1]. The species has very long history of use as medicine in ayurveda, homeopathy, ethno medicine and Indian system of medicine to modern medicine industry (Narayan Sharma *et al.*, 2017) [16]. The plant show a historical medicinal use in Ayurveda, ethnomedicine, homeopathy and Indian system of medicine (ISM) to current medicine industry. In the year 1790, Sir William James the famous orientalist discovered that 'Nardus' of the Greeks, the 'Spikenard' of the holy bible, 'Sumbul-e-Hind' of Persians and Arabians, and 'Balchar' of India all are 'jatamansi' of Sanskrit. *Nardostachys jatamansi* is a perennial herb carry a cylindrical rhizome that will be covered with brown to deep grayish fibers, rootstock woody, long and stout, covered with fibers from the petioles of withered leaves. Stem 10-60 Cm, more or less pubescent upwards, often glabrate below subscapose (kiritkar and Basu *et al.*, 1991) [11]. Nautiyal *et al.*, 2003 [13] used vegetative propagules and seedling transplantation methods under different treatments to carry out cultivation trials of *jatamansi* at three altitudes (low – 1800 m, middle – 2200 m and natural habitat – 3600 m). Variation in the economic yield occurred with treatment, age of plant at the time of transplantation and altitude of nursery. With the addition of manure in all the treatments and altitudes, the economic yield increased as compared to control. Cultivation was not found commercially viable at 1800 m in any of the treatments due to total mortality. At 3600 m, both vegetative grown as well as transplanted seedling crop showed marked profit in polyhouse condition. *Jatamansi* is known for several medicinal properties. The plant Used to treat epilepsy, hysteria, convulsive ailments, itch, boils, palpitations, diseases of heart, and diseases of the head. Other use also include ailments of the hair (Tripathi *et*

*al.*, 1996) [21]. The roots of the plant also used for enhance the complexion, increasing the luster of the eye and promoting the growth and rise the blackness of the hair (Jha *et al.*, 2012) [9]. The dried rhizome of *Nardostachys jatamansi* has been used in herbal combinations with other herbs to evaluate depressant activity. Ayurveda describe the roots and rhizome of *Nardostachy jatamansi* DC have various effects on "doshas". Ultimately it is trido shashamak but especially kapha-pitta nashak been clinically employed for their anti-ischemic, antioxidant, neuroprotective and anticonvulsant activities. *Nardostachy jatamansi* also useful as a memory enhancer. Rhizome of *Nardostachy jatamansi* DC is proved to be a useful memory restorative agent in the treatment of dementia and as antistress (Jadhav *et al.*, 2009) [7].

The plant is propagated by cutting of underground parts and sometimes by seeds. It is valued for its rhizomes (commonly called roots) used in India as a drug and also in perfumery. The rhizomes are collected from wild plants (wealth of India, 1997) [20].

Acharya Charaka emphatically depicts a great design of drug research and given much more importance for period of time or seasonal wise collection along with place and method of collection. He also describes the technical excellence in the field of pharmacognostical, Pharmaceutical, pharmaceutical and pharmatherapeutical sciences. Here *Nardostachys jatamansi* the season for collection of drug plays an important role in the field of drug research. (Vaidta yadavaji *et al.*, 2005) [22]. In Ayurvedic classics, drug collection has been described in four major steps i.e. bhumi pariksha (Selection of land), Sangrahaniya dravays (Selection of drug), Sangrahaniya Vidhi (Method of cultivation) and Sangrahaniya Kala (Time for collection). India is bestowed with rich plant diversity. To procure best qualities of drug the proper place of collection, part, method and time for collection are more important. (Swagata d tadhare *et al.*, 2014).

## Materials and Methods

Ayurvedic classics, compendia, phytochemicals, Soil and time of period, review and literature on modern method of propagate practices and papers documented research article data and information about these techniques is observed while compiling the information.

## Observation and Results

### Collection Vedic and Ayurvedic view

The Himalayas, often called "The Roof of the World", encompass a number of biodiversity hot spots and repositories of medicinal plants. The whole Himalayan range is envisaged as a trove of medicinal herbs, offering refuge to a variety of rare plants in its varied mountain ecosystems. The traditional practitioners have developed a number of herbal formulations for the treatment of various ailments with special emphasis on cardiac health, hair growth, memory and learning, liver disorders and kidney problems. As the popular alternative medicine, these preparations now constitute an important segment of the integrated health management all over the world. *Nardostachys jatamansi* plant grows well on open, stony and grassy slope with a 25<sup>o</sup>-45<sup>o</sup> slope. The existing status of the species and variations in its performance in different habitats were studied in selected sites in Uttarakhand, West Himalaya. Dripping moss-laden rocks and moist boulders are the most preferred habitats of this plant. The mean density in two contrasting slopes differed, showing relatively higher density on west facing slopes. Study reports that several biological and environmental features decide the favorable site of this plant and their abundance. (Airi *et al.* 2000) [1] Ayurvedic classics found that Jatamansi is described in, Sushruta Samhita, Nighantus Chikitsagranth and Charaka Samhita. In Charaka Samhita, it is described in Sangyasthapana Mahakashaya used as dhumvarti for hikkashwasa, used in Kushtha. Hrivradighrita used in arsha used in kasa. Mahapaishachikaghrita used in unmade. In Sushruta Samhita, it is described as Kumarasayana. (Purnima *et al.*, 2015) [14]. The art of collection had its origin in the prehistoric period, the written evidences starts from Vedic period suggesting its prime importance. Abundance, applicability, utility in multifarious modes and richness of quality these four are said to be the retard of desiderata in drugs (Vaidya yadavaji *et al.*, 2005) [22]. In order to obtain a drug in its most active state, the particular part to be collected from the proper place at proper time with suitable methods. The proper collection aims to procure a genuine drug with highest potentiality & purity which will improve the quality of the medicaments derived from them. The abnormalities in the season produced by abnormal conditions of stars, planets, moon, sun, air, fire, direction causes improper manifestation of jatamansi. Hence, it should be collected before the manifestation of abnormality. As per modern research, the chemical processes that occur in plant metabolism and some of the physical processes are regulated by temperature. Each species has its own optimum temperature requirement in which it grows optimally. In additions, some of the other environmental factors like humidity, duration of light, soil, soil structure, water, air, flora and fauna can also affect plant growth directly or indirectly. (Howarth *et al.*, 2005) [6] Thus, collection should be by considering all these factors. Bhumi of different types according to the nature of soil are described and advised to collect the plants which are growing on hills for their supremacy in quality (Ashashri shinde *et al.*, 2014). Data on morphological features (i.e. plant height, number of leaves,

flowers, rhizome length, diameter etc.) were collected from randomly-selected mature individual. (n=10) of each site of transect in July, August. Selected individual (n=5) were removed (whole) from the site and brought to the laboratory for biomass studies (Airi *et al.*, 1997) [2]. The substrate of *Njatamansi* varied from dry rocky crevices to moss laden rock surfaces. The substrate sample (500-700 g) collected from different stands of transect were dried in the sun for one week (Jakson *et al.*, 1967) [18] dried soil samples were packed in perforated polythene bags and stored at room temperature. Moisture content pH and organic carbon were determined (Allen *et al.*, 1989) [3].

Sandy loam and acidic soil rich in organic carbon and nitrogen was found best for germination as well as for better survival of seedlings and productivity. Moist and partial sunny areas are found suitable for cultivation. Further moist rough wall surface provide suitable microhabitat for better growth. At lower altitude (1800-2200m) plain beds with slight tilt (5-10°C) were found suitable for cultivation unlike horizontal and vertical beds at alpine site. For cultivation, better survival and yield of Jatamansi at lower altitude (1800m) 6070qs. Manure is required for one acre of land. However, the results were found best in litter treatment instead of livestock manure. The sites rich in organic carbon needed 46-60 q litter manure per acre for higher yield.

### Specific useful parts collection (phytochemical basis)

Naryan Sharma *et al.*, 2017 [16] has described that the different biochemical substance found in this medicinal plant such as ursolic acid, acacin, kanshone A, octacosanol, nardosinone, nardosinonediol, aristolen-9beta-ol, oleanolic acid, beta-sitosterol. It also contains nardal, jatamansic acid, jatamol A and B, spirojatamol, terpenoid, neolignans, taraxerone, valeranone, chlorogenic acid, ferulic acid, syringic acid and photocatechic acid. In roots sesquiterpene, ketone-jatamansone, liquid alcohols-nardol, calarenol and n-hexacosanol, a ketone valeranone and diethenoid ketone-nardostachane, n-hexacosen, n-hexacosanyl isovalerate, isovaleric acid, valeranone and  $\beta$ -sitosterol found (Govindachari *et al.*, 1959 and Sustray *et al.*, 1967) [5]. The different parts of the plant collected according to Months, climate, temperature, soil condition, rain fall and others. Some parts of the *Nardostachys jatamansi* were collected according to this view.

Plants should be harvested just before senescence after maturation to achieve the higher quantity of active contents. With a view to achieve higher amount of bioactive ingredients it must be collected during the months of September at lower altitude while in the months of October at higher altitude. The harvesting period for this species is 3-4 years, the harvested roots washed and dried in shade.

### Roots and Rhizome

A transverse section of the rhizome shows a thin periderm, it can be more or less circular in outline. A large parenchymatous cortex contains starch and an endodermis containing globules of volatile oil. Within a ring of collateral vascular bundles lies large pith containing scattered groups of sclerenchymatous cells. Cork: 2-5 layers of cells filled with oil granules. Cortex: Cortex is broad, 7-11 layers Cambium ring: Distinct and continuous. (Singh *et al.*, 2011) [18]. The rhizomes of the plant are used in Ayurvedic system of medicine as a bitter tonic, stimulant, and epilepsy, antispasmodic and to treat hysteria. Roots and rhizome are usually collected when their tissue are fully stored with reserve food being assumed that the phytoconstituents will be high during this season.

### Leaves

Leaves develops from both rootstock and stem. Basal leaves in rosettes are 15-18 cm long and 2.5 cm wide, longitudinally veined; leaves on stem is opposite pairs are about 7.5 cm long and 2.5 cm wide, sessile, base attenuate into petiole nearly equal to leaf blade in length, margin entire apex obtuse. Leaves are cauline, lower ones elliptic to obviate; upper ones sessile, on lanceolate to lanceolate, sometimes serrate. Leaves are collected from the plants during the flowering period, as plant is very active at this time. The sap movement and photosynthetic activity are maximum percentage of active constituents. (Shridhar Bairy *et al.*, 1997) The usual time for collection of leaves is when flowers are beginning to expand. At this time it is rational to assume that the leaves are in the healthiest state and contain optimum of the product of plant metabolism to produce desirable therapeutic action.

### Flowers

The inflorescence may have one or in rare cases 2-3 terminal capitates clusters. Flowers are pale pink or blue. Capitula of cymes, terminal, 1.5-2 cm broad; main inflorescence rachises and lateral rachises sometimes elongated; involucre bracts 4-6. Their calyxes are 5-lobed; fruit, usually ciliate. Corolla purple-red, campanulate, 4-9mm, 5lobbed; lobes broadly ovate to oblong. Stamens are nearly equal to corolla in length and are generally 4 in numbers, filaments villous. Style nearly equal to stamens in length, stigma capitate. The flowers are arranged in clusters and have many small flowers. They are bilaterally symmetrical and usually bisexual (Sanjay Nakoti *et al.*, 2017) <sup>[12]</sup>. Flowering and fruiting occur in March-April. Flower is collected in mid of the year the vegetative part is

very active and it's contain maximum percentage of active constituents at this season. In some other cases flower is collected in other season.

### Lunar plantation-an upcoming concept

According to the Isaac Newton laws of gravity, which explain the tides are affected by the gravitational pull of the moon. The pull of the moon is stronger than the sun because, even though the sun is larger, the moon is closer to the earth. The strongest effect is experience when the moon and sun pull from the opposite sides of the earth, at the full moon phase, although it also creates high tides when they are on the same side (at the new moon) as well. These same forces affect the water content of the soil, creating more moisture in the soil at the time of the new and full moon days. This increased moisture encourages the seeds to sprout and grow. From the laboratory experiments, it is known that light intensities as low as 0.1lux (approx 0.01 foot candle) during the night can influence the photoperiodic time measurement in some plants and animals. Yet the intensities of light from a full moon on a cloudless night may reach 0.3times this value in tropical regions. This fact lead E. Bunning and his colleagues to inquire whether moonlight can disturb time measurement and surprisingly their investigations revealed that some plants have adaptive mechanisms that apparently prevent moonlight from interfering with photoperiodism. Some of the night plants (short day plants) flower most potentially when grown with low intensity light (approximately 0.5lux) rather than complete darkness during the night. In these plants, moonlight probably increases the number of flowers produced by short day regime (Karnick *et al.*, 1977).



**Fig 1:** Collection of Himalayan medicinal plants *Nardostachys jatamansi* from different region of Uttarakhand

## Conclusion

*N. jatamansi* is an essential herb with multiple remedies. It is important plant of Ayurvedic material medica. *N. jatamansi* an important medicinal plant mentioned in Ayurveda and Unani system used for treatment of various diseases. The explanation of collection practices are well certifying in Ayurvedic, traditional literature and its advantage is validated by modern types of chemical tools for obtaining maximum quantity of active principles. Curative efficiency is presumed to depend, quality and quantity of the secondary metabolites which in turn are influenced by the method of collection a plant. The data analyzed in this communication highlight the importance advantage of collection practices to achieve desired therapeutic effect as herbs without good potency become useless weapon of medical, drugs as well as pharmaceuticals industries.

## References

1. Airi S, Rawal RS, Dhar U, Purohit AN. Assessment of availability and habitat preference of jatamansi- a critically endangered medicinal plant of west Himalaya. *Current Science*. 2000; 79(10):1467-1470
2. Airi S, Rawal RS, Dhar U, Purohit AN. Plant genet. *Res. Newslett*. 1997; 110:29-34.
3. Allen SE. *Chemical Analysis of Ecological Materials*, Black-well scientific publication, Oxford, 1989.
4. Ashashri S. Yield and phytochemical evaluation of wild and cultivated samples of Ashwagandha. *Jbso*, 2014, 2(2): ISSN 2321-6328.
5. Govindachari TR, Pai BR, Purushothaman KK, Rajadurai S. Jatamansone. *Tetrahedron letters*. 1959; 1(15):5-9.
6. Howarth CJ. Genetic improvements of tolerance to high temperature. In: Ashraf M, Harris PJC, editors. *Abiotic stresses: plant resistance through breeding and molecular approaches*. New York: Haworth Press Inc, 2005. 277300. ISSN:2321-3647
7. Jadhav VM, Thorat RM, Kadam VJ, Kamble SS. Herbal anxiety: Nardostachys jatamansi. *Journal of pharmacy and research*. 2009; 2(8):1208-1211.
8. Jackson ML. *Soil chemical analysis*. Prentice hall, New delhi, 1967.
9. Jha SV, Bhagwat AM, Pandita NS. Pharmacognostic and Phytochemical studies on the rhizome of Nardostachys jatamansi DC. Using different extracts. *Journal of Pharmacognosy*. 2012; 4(33):16-23.
10. Karnick CR. Effects of phases of moon on the growth and active principles of Acorus calamus (Bach.) *Nagarjun journal*, 1977.
11. Kirikar K, Basu BD. *Indian medicinal Plants*, India (Allahabad), 1991.
12. Nakoti SS, Juyal D, Josh AK. A Review on pharmacognostic and phytochemical study of a plant Nardostachys jatamansi. *The pharma innovation journal*. 2017; 6(7):936-947
13. Nautiyal BP, Chauhan RS, Prakash V, Purohit H, Nautiyal MC. Population studies for the evaluation of germplasm and threat status of the alpine medicinal herb Nardostachys jatamansi. *Plant Genet Resour News Lett*. 2003; 136:34-39.
14. Purnima, Meenakshi B, Preeti KA. Review article on phytochemistry and pharmacological profiles of *Nardostachys jatamansi* DC-medicinal herb. *Journal of phytochemistry and Pharmacognosy*. 2015; 3(5):102-106.
15. Sastry SD, Maheshwari ML, Chakravarti KK, Bhattacharya SC. Chemical constituents of *Nardostachys jatamansi* perfum. *Journal of Essential oil Recsearch*. 1967; 58:154-158.
16. Sharma N. A Review on chemical constituents and pharmacological use of Nardostachys jatamansi DC. *American Journal of pharmacy and health Research*, 2017, 5(7).
17. Shridhar B. Phytochemical and pharmacotherapeutic evaluation of Parijata (*Nyctanthes arborstristis* Linn.) w.s.r.to its effect on Gridhrasi. *IPGT & RA*, 1997, 6.
18. Singh V, Dubey P, Srivastava S, Rawat AKS. Botanical standardization of the jatamansi their substitute and adultrant species. *India journal of traditional knowledge*. 2011; 10(4):599-603.
19. Swagata DT, Nishteswar K. Collection practices of Medicinal plants-Vedic, Ayurvedic and Modern perspectives. *International Journal of Pharmaceutical & Biological Archives*. 2014; 5(5):54-61.
20. *The Wealth of India. An Encyclopedia of India's Raw Materials Resources*. ISBN: 81-85038-00-7, 1997.
21. Tripathi YB, Ekta T, Anil U. Antilipid peroxidative property of Nardostachys jatamansi. *Indian journal of experimental biology*. 1996; 34:1150-1151.
22. Vaidta Yadavaji Trikamji Acharya Agnivesha,' Charak Samhita,' revised by Charak and Dridhbal with 'Ayurveda Dipika' commented by Chakrapanidatta, Chaukhamba Surbharati Prakashan, Gopal Mandir Lane, Varanasi 221001, India, reprint 2005, Vimansthana 8/87), (Sutrasthana 9/7), (Vimansthana 3/4), (Sutrasthana 11/23), Vimanasthana ¾, (Kalpasthana 1/10), (Sutrasthana 27/316-317), 1996.