



Lesser-known Conservation Efforts of the Medicinal plants in Uttarakhand: An overview

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Abstract: Uttarakhand state is the part of the Indo-western Himalayas. Government-owned natural forest habitats are the source of about 90% of medicinal and aromatic plants. More than 1642 species of prospective medicinal plants are documented in the state distributed in subtropical, temperate, sub-alpine, and alpine climatic zones. Nearly 700 species of medicinal plants are used in the traditional system of medicines in Uttarakhand. The total area under the state forest department is 24,415 sq. km, and the forest managed by local communities through Van Panchayat is 5449 sq. Km. Increasing demand for plant-based or herbal medicines has resulted in the huge depletion of such plants and has promoted the illegal trade and unsustainable harvesting of medicinal plants. Local and poor communities are dependent on these natural resources to meet their traditional healthcare system and livelihood. The medicinal plant wealth of the state has received significant attention and it has been mentioned even in mythological epics. In this chapter, we would discuss the role of Medicinal Plants Conservation Areas (MPCAs) as In-situ conservation methods and the importance of Nakshatra Vatika, Rashi Vatiaka, and Navgrah Vatika as methods of lesser-known conservation efforts of the medicinal plants for promoting awareness of conservation of medicinal plants.

Keywords: Conservation, Medicinal plants, MPCA, Nakshatra vatika, Navgrah vatika. Rashi vatika

Introduction

Our traditional healthcare system, which relies heavily on medicinal plants, has received new support from the government as a result of the creation of the AYUSH. The traditional healthcare system does well financially and contributes significantly to the state economy, but the local population does not have access to its true advantages. By enhancing local medicinal and aromatic plant species of commercial and medicinal significance through systematic surveys, afforestation in accordance with silvicultural principles, and management recommendations, we can better meet the growing demand for medicinal plants for both domestic and international mark

Various studies have shown that many medicinal plants which were once common in the state have fallen into the threatened category. Overexploitation and climate change are the main reasons for putting a large number of medicinal plants in the state on the threatened list. There has been huge exploitation of the natural flora of medicinal plants to meet the demand has put many species on the verge of extinction. Sixteen plant species have been notified by the government they are on the verge of extinction. Scientifically planned and well-organized plantations of medicinal plants can play a significant role in their ex-situ conservation (Dhar et al. 2002). The establishment of herbal gardens in form of Navgrah Vatika or Nakshatra Vatika at social places will create awareness and enhance the traditional knowledge of medicinal plants among the public, especially the students.

Material and method



The study has been conducted on the basis of a literature survey available in the library of the B.D. Govt. P.G. College, Jaiharikhal, internet sources and to visit the places of the occurrence of the Nakshatra Vatika and Navgrah Vatika in Kotdwar, Gopeshwar and Rishikesh.

Result

Conservation is the prime concern in Uttarakhand to save the diversity of medicinal plants. Among different conservation methods, in-situ conservation is the best method for the conservation of biodiversity including medicinal plant diversity. The establishment of MPCAs in the state is a dedicated project for the in-situ conservation of medicinal and aromatic plants involving community participation and the state forest department. The state forest department has declared to dedicate 10% of its plantation solely to 34 identified plant species that have been classified as 'rare, endangered and threatened' which include many medicinal plants⁷.

The State Medicinal Plant Board Uttarakhand established in 2001 aims to facilitate economic development by modernizing the production of medicinal plants and strengthening infrastructure, extension, market, and research and development activities for the development of the medicinal plant sector in the state. The functions of the board, inter alia, include the documentation of traditional knowledge of medicinal and aromatic plants by preparing the Community Knowledge Register and People's Biodiversity Register and to conserve of the medicinal and aromatic plants in their natural habitats by establishing the Medicinal Plant Conservation Area (MPCA).

The Ministry of Environment, Forests and Climate Change (MoEFCC), the Government of India (GoI), and the United Nations Development Programme (UNDP) have been supporting the conservation and sustainable use of medicinal plants in India. Total, 108 Medicinal Plants Conservation Areas have been established across 12 States since 1993 as a key strategy for in-situ conservation of significant medicinal plants. Some MPCAs have a buffer zone of about 1300 hectares called the Medicinal Plants Development Area (MPDA). The Foundation for Revitalization of Local Health Traditions (FRLHT) has been instrumental in conceptualizing these MPCAs and MPDAs. The current Global Environment Facility (GEF)-GoI-UNDP (United Nations Development Programme) supported the project⁸.

For the conservation purpose of medicinal plants, the government of Uttarakhand has established 7 Medicinal Plants Conservation Areas (MPCAs) that have been set up in Uttarakhand. The MPCA in Uttarakhand was established in Kandara in Uttarkashi, Gangi in Tehri Garhwal, Jhuni in Bageshwar, Mandal in Chamoli, Khaliya in Pithoragarh, Mohan in Almora, and Bastiya in Champawat district in the year 2008 and it encompasses 1842 ha area. On average, the MPCDA includes about 200 ha. Area but smaller areas of important medicinal plant diversity can also be considered. Sacred groves may also be included in MPCA. The central government provides a hundred percent assistance for the development of MPCA at the rate of Rs. 20000 per hectare⁹.

The main purpose of the setting of MPCA includes –

1. To ascertain the threat status of the different important medicinal plant species traditionally obtained from the wild.
2. To identify the major cause of the threat to the different populations of the threatened medicinal plant species and its possible remedy.
3. To draw up the action plan for the conservation and sustainable use of important medicinal plant species.



For the previously designated MPCA, which was established three years back under different schemes the revisiting, reviewing, and documentation are done for further development activities like upgradation, documentation, and improved protection activities linking with a geotagging, area management plan, and community mobilization. The MPCAs which were established three years ago are given Rs. 5000 per acre for the up-gradation and strengthening by National Medicinal Plant Board (NMPB) or other schemes by many states.

The eligibility criteria to establish an MPCA/MPCDA include the state forest, wildlife department, corporations, federations and national or state-level research organizations, universities, the government recognized NGOs, with expertise in this field are also eligible to work on this conservation strategy. Ideally, the MPCA should be extended by more than 200 ha. area yet smaller but significant areas having rich medicinal plants biodiversity including sacred groves can also be considered for the establishment of the MPCA/MPCDA. For mainstreaming of management of medicinal plant conservation through the MPCA/MPCDA scheme based on sound management or silviculture approach up to Rs. 1.5 lakhs is provided to the concerned forest or wildlife division. The proposals for the establishment of a new MPCA/MPCDA may be submitted to the NMPB in relevant proforma as in annexure III retrieved from the website of the NMPB.

Engagement of the local and rural communities in the conservation of medicinal plants by establishing the MPCA is instrumental for the augmentation of conservation efforts of medicinal plants, the sustainable medicinal plant sector, and the economy of the local people as a whole. MPCA would assist the natural or artificial regeneration of local medicinal plants and conserve their genetic diversity and help to protect against the genetic erosion of the medicinal plants.

Ex-situ conservation of medicinal plants

Wild populations of many medicinal plants have dwindled to such a critical level that the viable population level is not available to initiate in-situ conservation. In such cases, the ex-situ conservation of medicinal plants complements the in-situ conservation in terms of helping in the protection of genetic diversity and reducing the pressure on wild habitats and also supports the availability of raw materials for different medicines. Thus, the ex-situ conservation of medicinal plants acts as a reliable seed source and gene bank for the production and regeneration of rare and critically endangered plants of high medicinal value (Maikhuri et al. 2016).

For land sources available in the state for ex-situ conservation include land outside the forest areas like blocks, strips, and boundaries of agroforestry land, marginal lands, and degraded lands in the villages and sub-urban areas. Plantation of medicinal plants in such areas can be raised with the help of Gram Panchayat, Van Panchayat, recognized NGOs, Tribal Development Corporations, SC-ST Corporations (in SC/ST land), municipal bodies, housing societies, forest development corporations, scientific organizations, AYUSH institutes and by the owners of the land by taking expertise support of NMPB. These lands can also be used for the establishment of astrologically designed medicinal plant gardens like Graha Vatika, Rashi Vatika, and Nakshatra Vatika.

The corporate sector can also be supported the plantation of medicinal plants in such areas with the adoption of good agricultural practices (GAP) and good field collection practices (GFCP). For this purpose, a Special Purpose Vehicle (SPV) involving AYUSH manufacturer and Panchayat or landowners will be formed with an initial corpus of Rs. 5 lakhs out of which 75% will be contributed by the



concerned corporate sector. The financial support from NMPB will be provided in form of a separate bank account to be opened in the name of the SPV. Such proposals are supported in project mode by the agency. The proposals can be submitted to NMPB in requisite proforma as Annexure III and retrieved from the website of the NMPB.

Astrologically designed medicinal plant gardens

Uttarakhand has an age-old tradition of having to protect the vegetation near the vicinity of sacred places and it has more than 1000 sacred groves in the state where many medicinal plants are conserved. The state has established many Herbal Gardens, Biodiversity Parks, and Astrologically designed medicinal plant gardens like 'Nakshatra Vatika' (Astral Garden), Rashi Vatika (Zodiac Garden), and 'Navgrah Vatika' (Celestial garden) on the premises of various institutes, particularly in educational institutes to help the students and people of the state to know about the medicinal plant wealth of the state and encourages them to promote and contribute for the conservation of the medicinal plants. These gardens also help to promote and strengthen the traditional knowledge associated with these plants. These gardens are well-known means of ex-situ and participatory conservation of medicinal plants.

Ancient Hindu scripture Vedas have directed us to respect trees and plants as parents. It is mentioned there that trees provide us with 'Pran Vaayu' or oxygen; they not only cleanse the environment but also maintain harmony between living beings and the earth. The Vedic scriptures mention a tree as equivalent to ten sons. According to astrological studies, a person can become free of ailments, and physical, social, and economic problems by planting a plant or tree as per the existing constellations, and zodiac sign at the time of his/her birth (Baghel et al. 2016). This is perhaps one of the reasons why our ancestors considered trees equivalent to gods and goddesses and revered them as the deity.

Vedic astrology suggests that grahas (planets) are the celestial bodies that revolve around the sun. The circular path of the graha is divided into 30° angles each of which forms a Rashi (zodiac). Each Rashi is further subdivided into 13° 20' angles to form a nakshatra (constellation). Thus, there are 9 grahas, 12 rashis, and 27 nakshatras and each of which is assigned to particular plant/plants. (Maneesha et al. 2021). All plants associated with graha or nakshatra are medicinally important and some of them are rare as well. They are supposed to provide a positive vibe to the person residing near it. Indian Horoscope of ancient India is prepared according to the day, time and position of graha and nakshatra which is supposed to be influential to predict the nature, behavior and fate of the newborns. According to Hindu mythology, worshipping Navgraha or their representative plants will help reduce the bad effects of the graha/nakshatra (Mishra 2018).

Navgraha Vatika (Celestial garden)

Worshipping the tree or plant as per the nakshatra provides magical benefits in life. The trees are to be worshipped as per the 27 constellations or nakshatras. All these associated tree species carry some or other medicinal properties to benefit.



The representative plants of Navgrah Vatika and Rashi Vatika are as below. The representative plants of Nav Graha Vatika are as follows -

S.N.	Graha/Planet	The common name of representative plant	The botanical name of representative plant
1	Surya (Sun)	Milkweed or Rui	<i>Calotropis procera</i>
2	Chandra (Moon)	Flame of forest or Palash	<i>Butea monosperma</i>
3	Mangal (Mars)	Cutch tree or Khair	<i>Senegalia catechu</i>
4	Budha (Mercury)	Prickly chaff or Apamarg	<i>Achyranthus aspera</i>
5	Brihaspati (Jupiter)	Sacred fig or Peepal	<i>Ficus religiosa</i>
6	Shukra (Venus)	Cluster fig or Gular	<i>Ficus racemosa</i>
7	Shani (Saturn)	Shami or Khejari or Sponge tree	<i>Prosopis cineraria</i>
8	Rahu (Dragon's head)	Bermuda grass or Doob	<i>Cynodon dactylon</i>
9	Ketu (Dragon's tail)	Halfa grass or Kush grass	<i>Desmostachya bipinnata</i>

Rashi Vatika

S.N.	Rashi/ Zodiac	Common name of representative plant	Botanical name of representative plant
1	Mesh (Aries)	(Red sandalwood) Rakt Chandan	<i>Pterocarpus santalinus</i>
2	Vrishabh (Taurus)	(Devil's tree) Sapt parni	<i>Alstonia scholaris</i>
3	Mithun (Gemini)	(Jack fruit) Kathal	<i>Artocarpus heterophyllus</i>
4	Karka (Cancer)	(Flame of forest) Palash	<i>Butea monosperma</i>
5	Sinh (Leo)	(Padri tree) Patala	<i>Stereospermum suaveolens</i>
6	Kanya (Virgo)	(Mango)Aam	<i>Mangifera indica</i>
7	Tula (Libra)	(Bullet tree) Maulshree	<i>Mimusops elengi</i>
8	Vrishchitk (Scorpio)	(Cutch tree) Khair	<i>Acacia catechu</i>
9	Dhanu (Sagittarius)	(Sacred fig) Peepal	<i>Ficus religiosa</i>
10	Makar (Capricorn)	(Indian rose wood) Sisham	<i>Dalbergia sissoo</i>
11	Kumbh (Aquarius)	(Sponge tree) Shami	<i>Prosopis cineraria</i>
12	Meen (Pisces)	(Banyan tree) Bargad	<i>Ficus benghalensis</i>

Nakshatra Vatika (Astral garden)

The Hindu Panchanga assigns a separate tree for each of the 27 constellations (Nakshatra) through which the planet sun passes. It is believed that the sun, moon, or other celestial bodies exert different influences on humans when they are transiting through these twenty-seven constellations. Worshipping the tree or plant as per the native's Nakshatra provides one with the highest merit. In the Atharvaveda, the earth is considered the mother and the people living on it symbolize her sons.

1. Ashwini nakshatra- The tree linked with Ashwini nakshatra is Kuchla (*Strychnos nux-vomica*). All desires are granted and all obstacles in life are removed by going around it 11 times and watering it frequently.

2. For the Bharani nakshatra, the Indian gooseberry, also known as the awala, (*Phyllanthus emblica*), is the recommended tree. Residents of the Bharani nakshatra are required to place kumkum on this tree daily, present whole grains of rice (akshat), recite hymns, and sit beneath this tree to meditate on the ishtha devta.



3. Krittika nakshatra's ruling tree is the globular or cluster fig (*Ficus racemosa*). The residents of Krittika are said to benefit by walking around this tree seven times each Friday and offering rice grains on its roots.
4. The Jamun tree (*Syzygium cumini*), which is believed to be honoured by those born under the Rohini nakshatra. On the day of Rohini nakshatra, locals from Rohini should give this tree some water, walk around it, and sprinkle some sugar and wheat on its root.
5. Kattha/Khair (*Acacia catechu*) is the tree associated with the Mrigshira nakshatra. Every Wednesday, residents of this nakshatra should worship it and offer water to it. It is thought that doing so guarantees great success in life. A little twig kept in one's pocket is likewise seen as lucky. is advantageous to Krittika nakshatra residents.
6. Indian rosewood, also known as Sheesham (*Dalbergia sissoo*), is the nakshatra's governing tree. It is said that constantly circling this tree and making an offering of durva grass will grant the wishes of those who were born under this nakshatra.
7. Punarvasu nakshatra: This constellation is connected with the trees babul (*Vachellia nilotica*) and bamboo (*Bambusa tulda*). To ensure luck, people born under this nakshatra should consume some babul tree leaves each day and carry a twig of the tree with them.
8. Pushya nakshatra: The heavenly tree recommended for this nakshatra is the peepal tree (*Ficus religiosa*). Residents of this nakshatra should water this tree, provide some sugar, and do a daily lap around it. Every Saturday night, light a lamp made of mustard oil under the peepal tree and walk around it nine times if you have Shani Dosha. This is thought to delight Shani Dev, who then frees Shani Dosha.
9. Nagkeshar (*Mesua ferrea*), the presiding tree of the Ashlesha nakshatra. Sitting beneath this tree and touching it every day will be beneficial to anybody born under this nakshatra. The fruit of this tree is said to have positive effects on life when kept in a locker.
10. Magha nakshatra: The bargad, also known as the banyan tree (*Ficus benghalensis*), is this nakshatra's ruling tree. The roots of this tree should be taken by natives and kept in their pockets at all times. It shouldn't be stored next to you when you sleep.
11. Palash tree (*Butea monosperma*), which is the nakshatra's ruling tree, is known as Purva phalguni. On Monday, residents of this nakshatra should collect seven of its leaves and store them in their locker. On the day of Purva phalguni nakshatra, they are to sit under the shade of this tree and perform a seven-circumambulation ritual.
12. The Pakad tree (*Ficus virens*) is the recommended tree for the Uttara phalguni nakshatra. It is very virtuous for the inhabitants of this nakshatra to offer sesame seeds and fruits on the roots of this tree.
13. Hasta nakshatra: The heavenly plant of this nakshatra is Chameli, often known as the jasmine plant (*Jasminum grandiflorum*). Residents of this nakshatra should give this tree water and, during an auspicious muhurta, collect nine of the tree's leaves to keep in their home.
14. Chitra nakshatra: The sacred tree for this nakshatra is Bel (*Aegle marmelos*). Every day, those who are born under this nakshatra should go around it and give it water.
15. Swati nakshatra: The Arjun tree (*Terminalia arjuna*) is the sacred tree that its residents are to worship. To promote their health, they should carry a little piece of this tree's bark in their pockets.
16. Vishakha nakshatra: The ruling trees of this nakshatra are the Kantai (*Flacourtia indica*) and the Parijat tree (*Nyctanthes arbour-tristis*). For their wellbeing and health, locals of this nakshatra should periodically sprinkle milk on the roots of these trees in their homes.



17. Maulshree or Bakul tree (*Mimusops elengi*) is the ruling tree of Anuradha nakshatra. To bring success into their lives, anyone born under this nakshatra should plant this tree in their home.

18. Jyeshtha nakshatra: The sacred trees linked with this nakshatra are Semal/Kapok (*Bombax ceiba*) and Neem tree (*Azadirachta indica*). A person born under this nakshatra should touch these trees and consume young neem leaves every day to strengthen their immune system.

19. Mool nakshatra: The sacred trees for this nakshatra are the Amaltash tree (*Cassia fistula*) and the Bel tree (*Aegle marmelos*). Residents of this nakshatra should perform a daily circumambulation and offer water for their wellbeing.

20. Ashok tree (*Saraca indica*) and Bet or Rattan cane (*Calamus rotang*) are auspicious trees for the nakshatra known as Purva ashadha. Every Wednesday, those who follow this nakshatra have to worship these trees by applying water and turmeric to the roots.

21. Uttar ashadha nakshatra - The auspicious tree for this nakshatra is the Kathal or Jack fruit tree (*Artocarpus heterophyllus*). Residents of this nakshatra should spend some time sitting under this tree and performing parikrama all around it.

22. The sacred tree linked with the Shravan nakshatra is the Aak plant (*Calotropis procera*). For their own well-being, people from this nakshatra should worship this tree daily.

23. Dhanishtha nakshatra: The Shami (*Prosopis cineraria*) and Nariyal (*Cocos nucifera*) trees are this nakshatra's ruling trees. One ought to grow a coconut tree within their home.

24. Shatbhisha nakshatra has Kadamba (*Anthocephalus kadamba*) as its ruling tree. People who are native to this nakshatra should touch this tree and talk to it about all their troubles. It is thought that doing so will solve all of life's problems.

25. Uttara bhadrapada nakshatra: According to this nakshatra, Neem (*Azadirachta indica*) and Aam (*Mangifera indica*) trees should be revered. Natives ought to keep it in their study or bedroom. They should also add four to five of these tree's leaves to their bathwater.

26. Purva bhadrapada nakshatra: Neem (*Azadirachta indica*) and Aam (*Mangifera indica*) trees are recommended as worshipping trees for anyone born under this nakshatra. Mango trees should be planted and cared for by the locals of this nakshatra. Offering water, unbroken rice, and kumkum in thanksgiving for the tree's blessings brings people health and success in their lives.

27. Mahua (*Madhuca indica*) is the ruling tree of Revti Nalshtra. It is said that on the day of Purnima, residents of this nakshatra should keep an imarti sweet under this tree. However, one should refrain from growing this tree inside a building or in a fruit orchard.

Typically tropical or subtropical natives, the Navgrah, Rashi or Nakshatra Vatika plants can be grown with ease in the appropriate climate with fertile soil and adequate water availability. These gardens are typically established in a circular space with the sun's spot in the centre. While planning the layout of these gardens, it is important to consider the size and canopy of a mature tree that belongs to these plants (Pandey et al. 2019). Additionally, it is important to leave enough room between mature plants to allow for easy movement and the performance of rituals. The majority of the Navgrah/Rashi/Nakshatra Vatika plants can be grown from seeds, but for the quick and simple establishment of these gardens, healthy seedlings that have received nursery care and have sufficient growth would be more beneficial.



Discussion

Divya Nakshatra Vatika Gopeshwar, Government Primary School Haldi Pantnagar, Government Inter College Harbertpur, Shantikunj Haridwar, and Motherhood Ayurvedic Medical College in Roorkee are few locations in Uttarakhand where Nakshatra Vatika/Navgrah Vatika has been created. Representative plants should have their botanical, astrological, and medicinal importance labelled on a permanent board to make these gardens more helpful and user-friendly. Once they are adequately established, the garden's trees can be used for worship and medicine.

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