



# Proceeding of the Webinar on **Promoting MAPs sector for Sustainable Development under Post Covid -19 Scenario in the Western Himalaya** August 28, 2020

## FROM THE DIRECTOR DESK



This issue of eNewsletter mainly contains the proceedings of the webinar on “Promoting medicinal plants sector for sustainable development in western Himalaya”, which was organized by the institute jointly with Prof. Y.P.S. Pangtey Research Foundation and Department of Botany, Kumaun University Nainital in the honour of Late Prof. Y.P.S. Pangtey, a renowned botanist of the region. As student of Prof Pangtey, I feel elated in sharing this issue of newsletter.

The importance of the Medicinal and Aromatic Plants (MAPs) for livelihood improvement and maintaining good health is well known. However, in present context when pandemic COVID-19 has disrupted human life across the globe, MAPs has emerged as potential solution is well reflected by the fact that WHO has agreed alternative medicine system like Ayurveda can be a solution to cure COVID-19. This becomes more relevant for the Himalayan region where diversity and uniqueness of medicinal plants is higher. Therefore, promotion of Himalayan medicinal plants sector for sustainable development in the aftermath of COVID-19 would be a timely initiative. This e-Newsletter include the views of different experts captured during the webinar and the articles received from various researchers in the Himalayan region. The Institute is all set to take-up lab as well field action to strengthen the sector all across the Indian Himalayan region through its decentralized setups and strong partner's network. Institute welcomes diverse stakeholders to provide inputs to strengthen initiative w.r.t. MAP sector.

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*Director*

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## **1. Background**

The Medicinal and Aromatic Plants (MAPs) not only form an important component of Himalayan Biodiversity but also play an important role in local health care systems and source of rural livelihoods. A significantly large proportion of the local people in the region rely on traditional medicines, mostly derived from plants, for their primary health care needs. The Himalayan region is also bestowed with a large number of formal and informal systems of medicine such as Ayurveda, Unani and Amchi. The sector has a potential to create rural assets, employment and wealth by raising, cultivation, development of small and micro-enterprises for processing and marketing and establishment of health and tourism related services. In accordance with the Rio Convention (Convention on Biological Diversity 1992), the MAP resources of the Himalaya attract all the three goals of Convention, i.e., the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

MAPs in the region are witnessing an increasing global demand, as a result the wild populations of most of these plants are facing continuous pressure thereby leading to their threatened status. With COVID-19 crisis and consequent global upsurge in interest for finding solutions from nature, there is every likelihood that requirement of Himalayan MAPs will shoot-up further in future. Indian scenario for healthcare has already registered a major shift towards natural products when several native plants and traditional recipes have emerged as potential cure and immunity boosters against COVID-19. There is an increasing trend in internal consumption and export of major Indian herbal ingredients such as Ashwagandha, Giloy, Tulsi, Kalmegh, Mulethi, Triphala, etc. This would put further burden on wild populations of such medicinal and aromatic plants (MAPs). Over the decades, several institutions and individuals have been actively engaged in MAP research and development in the Indian Himalayan region (IHR). Some of the states, namely Uttarakhand and Himachal Pradesh and the Union Territory of Jammu & Kashmir have established State Medicinal Plant Boards and state level research units. At the same time, the state governments and Department of Ayush at the Centre see tremendous potential in Herbal Sector in terms of engaging rural youth in conservation and management of MAPs.

## 2. Genesis of Webinar

Using the opportunity of International Day for Biological Diversity (IBD 2020), the G.B. Pant National Institute of Himalayan Environment (NIHE), an Autonomous Institute of Ministry of Environment Forest and Climate Change (MoEF&CC), Government of India, organized a webinar under the banner of “Himalayan Biodiversity and Future Solutions”. The webinar aimed at finding post COVID-19 possibilities with Himalayan Biodiversity. The key messages emanating from the webinar, among others, emphasized on promotion of MAPs and Wild Edible Plant sector by way of blending Traditional Knowledge and Practices (TKP) with new R&D knowledge. Realizing this, NIHE joined hands with Prof. YPS Pangtey Research Foundation (YPSPRF), Nainital and Department of Botany, Kumaun University, Nainital to organize this webinar in order to more intensively deliberate on “Promoting Medicinal and Aromatic Plants Sector for Sustainable Development under Post COVID - 19 Scenario in the Western Himalaya”.

The geographical scope of this webinar was entire Western Himalaya covering the States of Uttarakhand, Himachal Pradesh and two Union Territories - Jammu & Kashmir and Ladakh. The webinar was also organized to commemorate immense contribution of Late Prof. Y.P.S. Pangtey, Formerly Professor, Department of Botany, Kumaun University Nainital, in the area of Eco-floristics, Ethno-medicobotany and conservation of floral resources in the Western Himalaya.

## 3. Proceedings of the Webinar

### 3.1. Inaugural Session



Prof Lalit Tewari, as convener, opened the webinar with introducing the organizers of the event i.e., GB Pant National Institute of Himalayan Environment, Prof. YPS Pangtey Research Foundation and Botany Department, Kumaun University Nainital.

Webinar began with the welcome address by Dr. B.S. Kalakoti, President YPSPRF. While welcoming the participants and panelists he expressed great satisfaction that a number of leading research institutions and experts had come on a common platform to discuss this important issue and hoped that the webinar would bring-out some practical solutions for promoting MAP sector in the west Himalaya for larger benefit of people in the region.

**Dr. G.S. Rawat**, former Director Wildlife Institute of India, while offering tribute to Late Prof. Y.P.S. Pangtey, highlighted the key features of his biography wherein it was narrated how hailing from a remote high altitude village Milam (3400m asl) located in north-eastern part of Kumaun, against all odds pursued his education and finally developed his career as a Field Botanist and contributed significantly to the growth of Eco-floristics and Plant Taxonomy in west Himalayan region.



Prof. Pangtey, despite being shy of conferences, meetings and other academic gatherings, was very popular among researchers not only as a good Plant taxonomist, Phytogeographer and Ethnobotanist, but also as a good human being. He served



34 years (1972-2006) in the Department of Botany, Kumaun University, Nainital, guided 40 scholars for the award of doctorate degree (PhD), and had over 150 research papers, 6 books and 6 edited volumes to his credit. He established Herbarium and Botanical Garden in Kumaun University Nainital. In his honour, three plant species from Western Himalaya have been named i.e., *Nervilia pangteyana*, *Elaphoglossum pangteyii* and *Athyrium pangteyi*. Prof. Pangtey was honoured NASI Senior Fellow, UGC Fellow and elected fellow of National Academy Sciences, India. He was an outstanding teacher, mentor, and very passionate for the conservation of floral resources.





The inaugural address of the webinar was delivered by Prof. **N.K. Joshi**, Vice-Chancellor, Kumaun University, Nainital. He emphasized that the Himalaya is one of the global biodiversity hotspots having immense ecological and economic values for the country. Among various benefits of Himalayan biodiversity,

use of MAPs is well recognised for their potential as means of health benefits and source of livelihoods. He mentioned that still about 80% of rural community depends on traditional system of medicinal plants for curing various diseases. Citing examples of traditional practices such as decoction (Kaadha) made from Tulsi, Ginger, Giloy, rosemary, etc., to boost the immunity, he stated that Himalayan herbs have drawn more attention of the public due to their potential to improve the immunity under COVID-19 pandemic situation. Underlining the fact that around 90% of MAPs in trade are collected from wild, and around 66% are gathered through destructive harvesting, Dr. Joshi emphasized on reducing extractive pressure on these plants and save them from local extinction. Therefore, strategic planning is required for sustainability of the MAP sector and also the conservation of this precious group of plants. Highlighting on the relevance of this webinar under the current scenario of COVID-19, he indicated that around 2.5 lakh people have returned back to their homes in Uttarakhand due to COVID – 19 and therefore, MAPs cultivation and conservation can be one of the options for engaging them and providing

them employment. He congratulated the organizers for this timely initiative.



**Dr. R.S. Rawal**, Director GBPNIHE and Co-host of the Webinar in his introductory remarks paid homage to his teacher and mentor Late Prof. Y.P.S. Pangtey. He elaborated on the genesis of the webinar as an outcome of the earlier webinar “Himalayan Biodiversity and Future Solutions” organized by GBPNIHE on May 22,

2020 and therefore the present webinar was intended to deliberate more intensively towards finding actionable solutions. He requested all the experts to focus more on action oriented recommendations so that policy and practice interventions are made on a robust scientific base. Dr. Rawal also put forward the following objectives to be addressed during different sessions: (i) to understand the current state of knowledge on the conservation status of high value MAPs, demand and supply of such species (Session I); (ii) to assess the progress made w.r.t. cultivation and marketing of high value MAPs, and Access and Benefit Sharing (ABS) mechanism (Session II); (iii) to review the industrial /market needs, identify bottle necks, and suggest possible ways, for fulfilling the demand (Session III); and (IV) to provide way forward for effective use of Traditional Knowledge Practices (TKPs) and R&D knowledge for promotion of the sector and improved livelihoods of community (Session IV)

### 3.2. Panel discussion/ Presentations

Following the presentation of the key objectives, the panel discussion/presentations were held in four sessions. The sessions were moderated by Dr. G.S. Rawat, Former Director, Wildlife Institute of India.



#### **Session I: Current state of knowledge – regional assessments of high value MAPs**

This session began with the presentation by **Dr. G.S. Goraya**, Former PCCF and Head of the Forest Force, Government of Himachal Pradesh. While emphasizing

on the need for understanding demand and supply of raw material, he raised the following issues: (i) species identification for raw drugs (taxonomy, botanical name, etc.) is a major problem, and also the quantum of use is still unclear; (ii) a study by NMPB in 2015 has revealed that the national demand of herbal raw drugs was 512,000 MT in 2014-15, which has now increased to an estimated 650,000 MT in 2020. This demand was estimated on account of domestic industries, export, household or folk healers and wastage; (iii) main species in trade include *Picrorhiza kurrooa*, *Podophyllum hexandrum*, *Aconitum laeve*, *Polygonatum cirrhifolium*, etc.; (iv) the industrial export of MAPs is growing, thus there is increasing pressure on the populations of these species; (v) good planting material is generally not available to farmers for cultivation, and raw material is mishandled, which cause harvest and post harvest



losses thereby becoming a major challenge for the sector; (vi) uncertainty of market is the major constraint in MAP cultivation and trade; (vi) local inhabitants collect material from the wild without taking into account authenticity and quality; (vii) about 90% cultivation (2 lakh ha) in India is under cultivation of exotic species, and only 10% area is under native species.

While concluding, following recommendations were made:

Promote in situ conservation and augment MAPs in their natural conditions through the approaches of Medicinal Plant Conservation and Development Area (MPCDA) model under the aegis of Joint Forest Management (JFM).

Adopt better harvest practices, quality improvement through post harvest practices and storage backed by policy support.



**Dr. S.S. Samant** (Director, HFRI, Shimla) talked about the status of MAPs in India and within Indian Himalayan Region and informed that (i) there are over 9000 species of plants which are used in traditional system of medicine in India, and a total of 1172 are in trade of which 242 species having high consumption (>100 MT); (ii) earlier a total of

1748 species (native 309; threatened 165) were documented from the IHR, but recent data compilation suggests existence of 3175 MAPs species alone in the western Himalaya; and (iii) there is a need for conservation efforts w.r.t. MAPs across altitudinal gradient in IHR.

Dr. Samant recommended the following:

while MAPs of industrial importance need to be promoted, value addition at local level would bring more benefits to the communities.

prioritize species for ex situ and in situ conservation with peoples participation

develop an efficient information sharing mechanism

## **Session II: Progress-cultivation, marketing and ABS**

**Dr. Sanjay Kumar** (Director, CSIR-IHBT, Palampur) made a presentation on the use of biotechnological tools for conservation and sustainable utilization of MAPs in the IHR. Emphasizing on development of appropriate technology,

he suggested following ways to promote the sector: (i) focus on documentation of traditional knowledge on MAPs, propagation of priority species keep in mind the national needs, (ii) target R&D on extraction and isolation of bioactive compounds, (iii) use bioinformatics and in vitro and in vivo evaluation using animal models, and (iv) effectively use biotechnological tools for promotion of MAPs cultivation in the IHR.



Citing a few successful examples of CSIR-IHBT, he mentioned that under Aroma Mission, the Institute has been providing quality planting material and processing techniques to the farmers, and working towards establishment of market linkages to make the state of Himachal Pradesh number one in cultivation and marketing of wild marigold. He mentioned that integration of right variety with right techniques can do wonders in case of MAPs.

Dr. Kumar informed that India imports about 1145 tons raw Heeng (*Ferula asafoetida*) having market value around 77 million USD per year. Likewise, India imports 90 ton *Crocus sativus* (Saffron) but produces only 9.6 ton/year. Realizing this gap in demand and supply, IHBT is targeting improved variety, agro-techniques and developing market linkages for these plants to improve the livelihood opportunities and better economic returns to inhabitants. Further, Institute's work on tissue culture based mass multiplication of high value MAPs like *Nardostachys jatamansi*, *Trillidium govanianum*, *Picrorhiza kurrooa*, *Valeriana jatamansi*, etc. have reached farmer's field. He also stressed on the use of new techniques such as Hydroponic and Aeroponic culture for mass multiplication; use of advanced Fermentation Based Techniques for product development; and Drone Based Nextgen Hyperspectral Remote Sensing Techniques for species characterization. While concluding, following recommendations were made:

conduct gap analysis of MAPs research at national level so that country can become net exporter rather than importer

develop a platform for diverse stakeholders for knowledge/technique exchange

develop market linkages for the progressive farmers and other stakeholders

ensure Minimum Support Price (MSP) to farmers and strong enforcement on Access and Benefit Sharing (ABS) mechanism.

**Dr. C.S. Sanwal** (Director, HRDI, Gopeshwar) in his presentation highlighted the enormous scope for MAPs cultivation in Uttarakhand that can contribute to rural economy. Informing the participants on various initiatives of HRDI w.r.t. promotion of MAPs cultivation in Uttarakhand, he outlined a few initiatives viz., (i) setting-up of regional level sub centres for cultivation (at high altitude, mid altitude and terai region); (ii) establishing District level units of HRDI (i.e. Pithoragarh, Uttarkashi, Chamoli); (iii) organization of several training program for developing entrepreneurial skills to ensure livelihood through manufacturing products like herbal gulal, agarbatti, herbal tea, etc. He shared various success stories of MAPs growers in different regions and also flagged some issues and challenges of MAP sector including small land holdings, fragmented land, remoteness and other spatial constraints, poor connectivity, lack of technical knowledge and quality planting material, difficulty in assured market availability, etc. The following recommendations were made to overcome these challenges:

- establish nurseries for quality planting material
- develop farmer's training centres for sensitization and awareness building
- transform traditional farmers into entrepreneurs
- set-up herbal museum for conserving threatened species, etc.



**Dr. A.K.S. Rawat** (Executive Director, EMRC, Manipur), in his presentation, opined that this is the right time to make the Himalayan farmers aware of potential of MAPs given the increasing demand of MAPs in herbal industries. He informed the participants that under the COVID-19 scenario, the demand of herbal products such as hand sanitizers



containing *Azadirachta indica* (neem), *Ocimum sanctum* (Tulsi) etc., and immunity boosters containing *Tinospora cordifolia* (Giloy), *Withania somnifera* (Ashwagandha), etc. has increased tremendously. This provides opportunities for the cultivation and large scale production of raw drugs. Citing the example of *Picrorhiza kurrooa* he stressed the need for promoting and popularizing the several species for various uses. Other example cited was *Moringa oleifera*, as a promising food source containing high calcium, vitamin A & C, potassium, proteins which is in high demand. He explained that use of such high value MAPs will empower locals, and provide healthcare and economic opportunities during post COVID-19 period. He cautioned that drug safety is an important consideration which should be ensured through pharmacological investigation, human studies and confirmatory clinical trials. He concluded his talk with following recommendations:

- identify high/elite MAP species/chemotypes/varieties for promoting cultivation,
- development of quality control labs at different locations as per Indian pharmacopeia
- formation of clusters for cultivation of industrially important MAPs at village level

### **Session III: Review- the industrial and market needs**

**Dr. J.L.N. Sastry** (CEO, NMPB, New Delhi) gave a brief overview of NMPB's initiatives towards promoting MAP sector in the country and pointed out a few challenges faced by the industries, viz., (i) non-availability of quality planting material (QPM), (ii) lack of trained manpower, (iii)

poorly developed infrastructure, (iv) lack of standardized practices for collection, cultivation, harvesting techniques, post harvest management, processing, packaging, etc., (v) lengthy gestation period, (vi) high dependence on wild populations of many species, and (vii) remoteness of the localities where raw materials are available. He also stressed on the need for genetic and chemical fingerprinting of germplasm in order to ascertain the quality of planting material. He stated that trends on requirement on MAPs are changing fast with increasing export market which calls for attention on value added products such as extracts rather than the raw material and that with known source of material having passport data, the value goes high. Dr.



Sastry explained that COVID-19 has created an opportunity for developing herbal industry, citing the example of Chyavanprash that was sold 64% more than average of last 10 years during this period. He further mentioned that relocated rural populations due to COVID can benefit through MAP cultivation and herbal industries development, and this will improve rural economy. By making a statement “Nature cares for Ayurveda but Ayurveda does not care for nature” he stressed on need for making herbal industry more friendly for promotion of herbs and restoration of nature. He concluded with following major recommendations:

Address the issue of Quality Planting Material

Strengthen activities as per the changing trends of export market to maximize the benefits

Convince the industry to become more responsible for protection and restoration of natural populations of species



**Dr. B.S. Kalakoti** (Director, Himex Naturals Pvt. Ltd.) stated that although COVID-19 has created huge danger for humanity, it has boosted herbal industry. Demand of medicinal herbs has recorded a shoot up of 3-4 times during COVID-19, and the market is full of opportunities. Citing an example, he said Patanjali is selling the herbal immunity

booster ‘Coronil’ of the value Rs. 6 crore per day. He said that prices of most of herbal raw material have gone high as compared to the previous year. As an industry person, he explained some constraints such as uncertain supply of raw material, high raw material cost, no harmonised regulations, untrained manpower, etc. While concluding, he made following recommendations:

promote entrepreneurship amongst Himalayan people  
build capacity on product and project identification  
promote primary processing and value addition at local level

provide market support, promote contractual farming, facilitate buyback arrangements, and develop cooperatives.

**Dr. Hema Lohani** (Director, CAP, Dehradun) specifically highlighted the importance of aromatic plants in perfumery or fragrance and nutraceuticals, and informed that India ranks 2nd in essential oil production with 21-22% share.

She mentioned COVID-19 has increased demand for herbal sanitizers, disinfectants, immunity boosters, herbal fragrance and cosmetics, etc., which provides opportunity to pharmaceutical companies and also to the producers. Speaking on opportunities, she informed that Uttarakhand government has declared Aroma Park Policy 2018, and the park (in Kashipur) will have around 50 aroma industries which will create more than 1500 job opportunities for the Covid-19 returnees of Uttarakhand. Also, returnees can start aroma based micro-enterprises in rural areas of Uttarakhand. Dr. Lohani recommended the following:

promote cluster based cultivation and processing units of MAPs,  
rehabilitate abandoned land through cultivation of MAPs,  
state government should give incentives to farmers on cost of cultivation, processing and marketing, and distribute free planting materials



#### **Session IV: Promotion-blending TKP and R&D knowledge**

**Dr. Padma Gurmet** (Director National Research Institute for Sowa-Rigpa), Leh-Ladakh, in his presentation focused on the medical heritage of Sowa-Rigpa (Science of healing), popularly known as Amchi or Tibetan Medicine, one of the oldest and well documented

living systems of medicine, originated from India and has been practised in many countries of central Asia. In India, this system of medicine is widely practised in Ladakh, Padar Valley (J&K), Kinnaur and Lahaul-Spiti (Himachal Pradesh), Sikkim, Darjeeling, Kalingpong (West Bengal), Tawang (Arunachal Pradesh). It has been formally recognized as AYUSH system of India by amendment to the Indian Medicine Central Council Act, 1970 and came into force from January 1, 2012. He further talked about the role of Sowa-Rigpa in the treatment of COVID-19 patients, as the fundamentals of Sowa-Rigpa and Ayurveda are the same and both can become useful in the formulation of immunity





booster and can treat COVID-19. Towards conclusion, he recommended the following:

Sowa-Rigpa must be promoted in Himalayan regions for public health and economic development  
frame regulations for developing Sowa-Rigpa industries, promotion of traditional knowledge and their scientific validation

explore potential of Sowa-Rigpa and traditional medicines for treating new age diseases like cancer, HIV-AIDS, hypertension, diabetes, and pandemics like COVID-19, SARS and MARS, etc.

**Dr. Sumeet Gairola**, Senior Scientist, from Indian Institute of Integrated Medicine (IIIM), Jammu highlighted the major achievements and initiatives taken by IIIM for the promotion of MAPs sector during 25-30 years. He highlighted the achievements on preclinical and clinical trials on many MAP based drugs, development of agro-techniques and large scale commercial cultivation, cross cultural ethnobotanical studies and centralized database, and integration of MAPs with improved livelihood of local communities. He also shared several success stories of farmers in the area of MAPs cultivation with the help of IIIM, and shared information that the first plant (*Cocculus hirsutus*) based drug from India is under clinical trial for COVID-19. He said that IIIM took the initiative and got the first licence in India on research and development activities on Cannabis germplasms, and also indicated the role of MAPs for sustainable development under post COVID scenario in western Himalaya through promotion of cultivation and processing of high value MAPs, setting up of distillation and processing facilities, cooperatives for marketing, value addition and product development. While concluding, he recommended the following:

coordinate efforts of research organizations for development of a centralized database along with ethnobotanical information and herbarium specimens, identify the most useful plants for drug recovery and product development through conducting cross-cultural ethnobotanical studies in Western Himalaya, ensure end to end technology transfer on cultivation, processing and marketing of high value MAPs with buy back arrangements.



**Dr. M.C. Nautiyal**, Professor, High Altitude Plant Physiology Research Centre (HAPPRC), HNBGU, Srinagar Garhwal emphasized that the traditional/indigenous knowledge is prevailing among different communities, tribes and people adapted to a certain locality, culture and environment. With the

progression in the techniques of phytochemistry and pharmacology, many active principles of medicinal plants have been isolated and introduced as valuable drugs in modern system of medicine. Simultaneously, a large amount of work has focused attention on isolation and characterization of several new bioactive molecules and development of novel effective medications in the recent past. Despite the development of a lot of modern drugs, there is still a need of developing new therapeutic agents for those diseases where no satisfactory cure is available in modern system of medicine. He recommended the following:

build synergy between traditional healers and institutions working on MAPs, and develop a common platform for traditional healers, R&D institutions and herbal industries,

undertake authentication of traditional herbal formulations by estimating the bioactive compounds  
develop model nurseries for quality planting material in order to minimize pressure on wild resources and maintaining a steady and sustainable supply of raw material

create awareness among the locals about their MAP resources and to extend the technological knowhow to the interested growers about the cultivation of important MAPs

#### 4. Way forward

While deliberating on way forward Dr. R.S. Rawal (Director, GBP-NIHE) thanked all the panellists for active deliberations and mentioned real success of this event will depend on how we can move forward with all the challenges and limitations. The earlier (I webinar of May 22) and the present webinars (II webinar) organized by the Institute clearly indicate the need for (i) better documentation through field assessment of MAPs, (ii) adequate understanding of demand and supply, and (iii) increasing pressure on natural populations of MAPs. Therefore, the research organizations, like GBP-NIHE, can take up these suggestions on priority and move forward to contribute for developing MAP sector. Further, based on inputs received, following require immediate attention of concerned:

Technical interventions are very important and can increase the production and commercial value of products in case of MAPs.

Accessions of planting material is important and fulfilling quality planting material demand is a major issue. Institutions like CSIR-IHBT have developed some varieties, but the demand of material is so high that it could not meet farmers requirement and thus, these success models are required to be up-scale and out-scaled.

Various success models were discussed during webinar, but their up scaling and out scaling is a major challenge.

UN has declared next decade for ecological restoration, so we should think on how various organisations, especially herbal industries can take part in cultivation and restoration of MAPs populations.

Dr. G.S. Rawat, moderator of the webinar, encouraged all the experts and participants to submit their recommendations related to conservation and marketing of MAPs. He said that several recommendations related to biotechnological interventions and ABS model have come up through webinar. Inputs for strengthening in situ conservation and capacity building of industries is needed. He emphasized that there is need for synergy among different players or organizations working in the same field. He highlighted that user friendly policies on MAPs for country need to be evolved.



**Dr. Indra D. Bhatt**, Scientist-F and Centre Head, CBCM, GBP-NIHE proposed vote of thanks to the participants who contributed to the success of webinar. He specially thanked the distinguished speakers / panellist for their in-depth and informative presentations, valuable discussions and recommendations.



## Post Covid -19: Opportunities for Promoting MAPs sector in Mountains

The unprecedented COVID-19 outbreak has been affecting all segments of the population worldwide and the global mountain community has also not remained untouched. About 30-40% of the global mountain population is already affected by poverty and poor health, and the new infectious challenge i.e. COVID-19 has further enhanced the negative impact on food, health and livelihood security of the region. However, mountains comprise a great diversity of medicinal and aromatic plant species (MAPs), and mountain livelihood and primary health care needs largely depend on collection, utilization and trade of these MAPs. Recently, modern system of medicine is also getting much interested in plant based drugs due to its high efficacy and relatively lesser side effects, however, the commercialization of MAPs have caused overexploitation from wild and accelerated depletion of resources. Thus, strengthening the map sector through MAP cultivation and sustainable utilization could contribute to enhance livelihood options and reduce the poverty of rural mountain population, along with protecting the MAP diversity of region.

Covid-19 pandemic triggered reverse migration from industrialized states to native states including many mountainous regions. This has lead to congregation of young energetic populations in the native areas who are currently seeking employment possibilities; and this could be considered an hidden opportunity for the development of abandoned rural areas by promoting locally available high valued natural resources. Developing medicinal plant sector in mountain regions by directing returned enthusiastic young pool for cultivation of high valued medicinal plants, using advanced agro-techniques, promoting sustainable harvesting, value addition, marketing and development of small scale processing industries, with the support of various government schemes, will help not only to provide livelihood opportunities, but will also promote efficient utilization of MAP species in mountain areas. Vast availability of diverse kind of medicinal plants in these landscapes will also help to promote extensive research on developing plant based drugs to combat various ailments including novel coronavirus infection. For instance, medicinal plants such as *Artemisia annua* are being considered as possible treatments for COVID-19. Several pharmaceutical companies and research institutions are trying to develop medication against the novel coronavirus infection using bioactive compounds or raw material of plants like *Withania somnifera*, *Ocimum sanctum*, *Camellia sinensis*, etc. Some Himalayan medicinal plants like

*Plantago major*, *Justicia adhatoda*, *Verbascum thapsus*, *Hyoscyamus niger*, etc. possess antiviral properties and can also be used to develop novel antiviral drugs, thus, should be promoted for cultivation. However, there might exist a skill gap among the returned youth for MAP cultivation, which can be fulfilled by providing training in the related sector. The native states could be benefitted for long term if the returning pool is tapped judiciously by appropriate policy push, thus, the involvement of government by providing trainings and subsidy in MAP cultivation, generating awareness about various schemes/policies and high price trends of MAPs, etc. will be crucial for encouraging locals. Returned younger generation with knowledge of family based traditional practices on MAPs will also have opportunity to integrate advanced techniques and government plans on MAP cultivation and may get higher profit through various innovative practices. The demand of medicinal plants has increased 3-4 times post COVID-19 and the national/international trends in MAPs have expanded.

Many herbal industries have increased production of herbal sanitizer, disinfectant, immunity booster, herbal fragrance, etc. Thus, enormous scope exists for sustainable development of MAPs in mountains post COVID-19, some of which are as follows:

With more people back in the villages, pressure on agricultural land has increased. Thus, MAP cultivation with more secure farming practices like increased irrigation, insurance, and climate adaptability, etc. should be adopted. Since many MAP species require long gestation period before maturation, cropping long term plant species with short term species will help to ensure continuous agricultural economy. Government support in the form of MSP to farmers for long term crops should be given.

Majority of the farmers in the mountain areas have marginal or small land-holdings, thus, land pooling can be a way to start large scale cultivation of MAPs.

Intercropping of medicinal plant species with agricultural crops can be performed. For example, intercropping of *Origanum vulgare* and *Picrorhiza kurroa* with potato is successful and can be implemented by farmers.

The barren/degraded land area of forest could be made available to returned migrants to develop it as medicinal plant gardens or nurseries comprising various MAPs



# TOPICAL ARTICLES

ISSUES	SOLUTIONS
Unemployed returned migrants	<ul style="list-style-type: none"> <li>Awareness generation on increased herbal industrial demand, available govt. schemes, 30-75% subsidies to encourage them for MAP cultivation.</li> <li>Providing free climate resilient quality planting material and agro-techniques for antimicrobial and antioxidant rich species, and sharing benefit at time of harvest.</li> <li>Developing cluster based approach for cultivation and processing units</li> </ul>
Small landholdings	<ul style="list-style-type: none"> <li>Availability of degraded forest land for cultivation</li> <li>Land pooling</li> </ul>
Quality planting material(QPM)	<ul style="list-style-type: none"> <li>Community based mother nurseries for large scale supply</li> <li>Herbal gardens containing various MAP accessions, which can be mass multiplied through institutional support using technological interventions</li> </ul>
Long gestation period	<ul style="list-style-type: none"> <li>Intercropping of long term MAPs with agricultural crops short term MAPs</li> <li>More secure farming practices like insurance, irrigation etc.</li> <li>Minimum support price (MSP) to farmers for long term crops</li> </ul>
Conservation	<ul style="list-style-type: none"> <li>Community based cultivation of several RET species</li> <li>Promoting native species more than exotic species</li> <li>Identification of <i>in situ</i> conservation areas and regulation through rotational grazing, community participation, etc</li> </ul>

Fig. 1: Various issues and solutions for promoting MAPs sector post COVID-19.

especially rare and endangered (RET) species suitable for the microclimate, and a community based management and marketing will further encourage the returned youth.

Locals should be encouraged to grow various medicinal plants in their home gardens by providing free planting material and technical knowledge on regular basis. This could be a small step towards encouraging people for large scale cultivation of medicinal plants.

Cultivation of various MAPs with higher antioxidant and antimicrobial properties should be promoted by providing planting material and agro-techniques, and various small scale herbal industries should be developed for further value addition of produce and development of immunity booster products which are in high demand during post COVID -19 scenario. These products can then be marketed using mountain labelling (or labelling of source) after quality analysis, which will further improve product value.

Setting up distillation unit for extraction of essential oil from aromatic plants and its marketing can help get higher prices than raw material supply.

Various government and non-government organizations along with enthusiastic entrepreneurs should take lead in involving and facilitating the returned migrants in MAP cultivation.

Awareness should be generated among returned migrants regarding already existing schemes like Centrally Sponsored Scheme of National Medicinal Plants board (provide 30-75% subsidy to farmers based on prioritized species), Voluntary Certification Scheme for Medicinal Plants (promote good agricultural and collection practices), Central Sector Scheme on Conservation, Development and Sustainable Management of Medicinal Plants (support is provided for survey, *in situ* and *ex situ* conservation, research and development, etc.) and others.

Several schemes like Mukhyamantri Swarojgar Yojana (Uttarakhand Govt.) have been launched to promote self-employment of returned migrants by providing 15-25% immediate subsidy. Likewise, several specific schemes for attracting returned migrants towards MAP cultivation are required.

Some issues and their probable solutions for promoting MAPs sector post COVID-19 are represented in Fig. 1.

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## Say Hi! To Herbs

**B**eginning of the decade “2020” brought us Pandemic “Covid-19” that made us realise that “**to boost High Immunity (HI)**, we must say **Hi! to Herbs**” in our life. Herbs not only boost our immunity but have effectively been used to cure many ailments. Historically in the pandemic influenza of 1918, there are reports of patients being successfully treated with herbs alleviating painful symptoms in them. It also helped in reducing pulmonary complications and number of deaths at that time. Covid-19 has once again brought into limelight the fact that it's time to look back into nature because our solutions lie in nature.

**Back to Nature:** Comeback of “Kaadha”, Healing “Haldi”, Soothing saline gargles, humble amalgam of honey and ginger, traditional grandmothers’ recipes for high immunity against corona virus is a step forward in the direction of our natural solutions for diseases outbreaks. Medicinal and aromatic herbs have been a part of Indian lifestyle since time immemorial. Turmeric rich milk (Golden Milk) has long been given by our mothers/grandmothers against allergies, for relieving body aches and inflammations. Cloves, cinnamon, ginger powder, basil, cardamom the basic ingredients of Kaadha have been known for their medicinal properties used as spices in our kitchens. “Charak Samhita” depicts the importance of herbs, natural salts, honey, oil and spices in treatment of various ailments in Ayurveda. Greek document “Materia Medica” written sometimes in 65 AD highlights the importance of sage plant: “How can a man die who has sage in his garden?” Many folklores and sayings in hills such as “*Bana basuti te bare jethi houan thethi manu kian mare*” means a man cannot die of disease in an area where *Vitex negundo* (bana), *Adhatoda vasica* (basuti) and *Acorus calamus* (bare) are found. Similarly another common verse is “ Harad, bahera amla bich payi giloye, jithonye char chijan utho admi kyon moye”. It means if there are four plants viz; *Terminalia chebula* (harad), *T. bellerica* (bahera), *Emblica officinalis* (amla) and *Tinospora cordifolia* (Giloye) available, a person will not die of diseases. This very well describes that every herb, every tree and every flower had its unique quality that can be used to fight different ailments. Besides, many modern day drugs such as Quinine, Aspirin, Reserpine have also been developed from plant based resources. Presently, many researchers are working on herbal formulations such as herbal sanitizers, soaps, cleansers, herbal tea and “Kaadha” to prevent corona virus infections. This has exponentially increased the demand for natural herbs.

Therefore, to maintain the natural resource base for our research and development activities, we need to nurture the habitats where these plants grow in nature.

**Nurture the Nature:** India with vast diversity in landscape support different types of ecosystems. These ecosystems form habitats for a variety of plants including medicinal and aromatic herbs. Many of the important herbs are specifically restricted to sub-alpine and alpine regions of the Himalaya. *Aconitum*, *Arnebia*, and *Jurinea* flourish in the undulating alpine meadows while *Picrorhiza* and *Rheum* restrict themselves to the moist rocky slopes. Marsh meadows have a dominance of *Dactylorhiza* while *Podophyllum* and *Nardostachys* peep out from rocky crevices and boulders. Almost all of these highly valuable medicinal and aromatic herbs occur at an altitude of over 2800m. However, overexploitation, unscientific harvesting and overgrazing over the years has resulted in habitat degradation and a decline in their population. As a result, most of these have been listed in Appendix I and II of CITES.

With the revival of traditional medicines post –COVID-19 period, the pressure is going to increase on already degraded habitats. Therefore, need of the hour is *in situ* and *ex situ* conservation of these herbs. Identification and monitoring of “species specific conservation sites (SSCS)”, use of scientific techniques such as tissue culture, hydroponics and poly-houses to develop herbal home gardens will be useful. The time has come to awake “guardians of the earth” i.e. the local knowledge holders in developing ethnobotanical gardens and acknowledge their role in nurturing the nature.

**Tapping the traditional knowledge:** Local knowledge holders are the foundation stones of “Think globally act locally” catchphrase of recent decades. They are the holders of traditional wisdom dealing with ecological conservation and sustainable survival. Over the years adaptive nature, applicability and value of local knowledge system has been tested, validated by science and also incorporated in conservation planning in some areas. An example of this is the fusion of traditional knowledge of Kani tribe on *Trichopus zeylanicus* with research inputs of TBGRI scientists to develop Jeevani- a drug to fight fatigue and stress. In post covid-19 scenario it becomes even more significant to be “vocal for local”. For the conservation of herbs in the innermost valleys of Himalayas, it becomes more imperative to involve local people in developing collection and

processing protocols for herbs, policies for recuperation of degraded habitats, cultivation of herbs, and development of herbal gardens. This will not only strengthen their cultural identity but would also help them in becoming self-reliant.

**Support the Self-reliant India:** One self-reliant individual can raise opportunities for many others in the society. Reaping the traditional knowledge of elderly people and involving unemployed educated youths in developing herb based MSME's and building capacity of recently returned labourers through training and awareness programs would not only help them form a self-reliant society but would also solve the problem of outmigration in hills. Empowering women self-help groups in processing and packaging of herbal products will also help in equitable sharing of benefits among genders and an overall socio-economic upliftment of the society. Many such examples have already come into limelight. Villagers in Himachal have fetched a four-fold profit by cultivating “wild marigold” taking inputs from CSIR -IHBT laboratory. Similarly, people in “Barsu” village, Uttarakhand are also working to conserve repository of herbs – “the Dayara Bugyal” (Fig 2).

Therefore, saying Hi! to herbs can make our villages self-reliant and also help us overcome the health challenges faced during times of pandemics and disease outbreaks such as Covid-19.

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Fig 2. (A). Collection of *Picrorhiza*, & (B). Drying of *Picrorhiza* in field



### ***Picrorhiza kurroa* Royle ex Benth: Cultivation for sustainable livelihood development in Himachal Pradesh, North Western Himalaya**

**P**lants and human beings have intimate relationships since remote past and have evolved along parallel lines cooperating with each other for existence. Since the beginning of human civilization, medicinal plants have been used by mankind for its therapeutic value. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources. Synthetic medicines have numerous side effects, so the demands of herbals medicines are increasing day by day. Traditional medicine has remained as the most affordable and easily accessible source of treatment in the primary healthcare system of resource poor communities in India and there is a clear and increasing interest in the extraction and isolation of natural products and their advantageous applications. These specific applications are also conditioning the employed extraction methods and novel stationary phases and mobile phases to be used by these techniques. It is thus expected that these trends will be maintained in the near future as they are mostly motivated by emerging consumer demands and by safety, environmental and regulatory issues. In the current scenario the whole world is facing the pandemic, the Covid-19. It has been seen that the people with weak immune system are more prone to the disease. With the synthetic medicine for the disease not available at present clinical trials are being undertaken by Ministry of AYUSH for the preparation of ayurvedic drug for Covid -19. Emphasis is being laid on strengthening the immune system of people. For this purpose the Ministry of AYUSH has chosen many medicine plants for clinical trials, one of which is *Picrorhiza kurroa*.

*Picrorhiza kurroa* Royle ex Benth. belonging to family Scrophulariaceae, is a high value endangered medicinal plant in Indian Himalayan region. The vernacular name is Kutki derived from “Karu”, which means bitter.

In the traditional medicinal system this medicinal plant is used to cure malaria, jaundice, snake bite, asthma, fever, and liver disorders and the pharmacological properties include, anti-malarial, anti-diabetic, hepato-protective, immune modulating, antiasthmatic, anti-inflammatory and anti-cancerous. Roots of *P. kurroa* are also one of the main ingredients of Tab. AYUSH-64 which is an ayurvedic medicine under trial for Covid-19. In *P. kurroa*, active ingredients in roots contain Picrorhizin. A glycosidal bitter

principle kutkin, a non-bitter substance kurrin, vanillic acid, kutkiol occurring as acetate and kutkisterol from the drug, Kutkin, apocynin, alkanol, alkane, etc. are also reported.

This species is distributed in alpine region of the Himalaya from Kashmir to Sikkim extending to West Nepal between 3300-4300m. In Himachal Pradesh, it is reported from Kangra (Bara Bhangal, Chhota Bhangal and Uhl valley), Chamba (Dalhousi, Pangi and Bharmour), Lahaul & Spiti, Kullu (Hirb-Shoja catchments, Allain-Duhangan catchments, Seraj, Rohtang Pass, Great Himalayan National Park, Manali, Kais, Tirthan and Kanawar Wildlife Sanctuaries, Chhakinal and Parvati valley), Kinnaur (Sangla valley) and Shimla (Kotgarh, Rohru and Chopal) and Sirmour (Rajgarh) districts above 3200m in moist rocky slopes, near water springs and old land slide areas. Due to its high medicinal potential, this species is under high demand in national and international market. The endangered status of this medicinal herb has resulted in imposition of legal restrictions on the collection of raw material from natural habitats, which has not only resulted in shortage of material to pharmaceutical and herbal drug industries but also caused economic constraints to the local communities, whose livelihoods depends on medicinal herb. Therefore, a practical solution would be to encourage commercial cultivation of this high value medicinal herb to counter the multi-faceted problems of endangered status, non-availability of sufficient and high quality material to industries and more importantly not depriving the rural/tribal communities from their revenue generating avenues. However, the major impediment in the commercial cultivation of this medicinal herbs has been non-availability of authentic elite planting material, lack of appropriate agrotechnology, as well as lack of assured buy-back mechanism between industry and farmers. Therefore, production of quality herbal raw material by maintaining chemical/genetic purity would go a long way in providing a sustainable solution to the problem.

For this purpose a project entitled, Identification of elite planting material of selected temperate medicinal herbs, mass multiplication, field demonstration and post harvesting processing’ funded by Department of Biotechnology, has been undertaken by G.B. Pant National Institute of Himalayan Environment (GBPNIHE), in different district of Himachal Pradesh. Under this project authentic elite planting material of *P. kurroa* was distributed among the farmers of district



Kullu and Chamba of Himachal Pradesh (Fig 3). Thereafter proper agro technology was explained and performed to the farmers. Assured buy back of the final produce by Zandu Foundation for Healthcare (ZFHC), Gujrat was also given to the farmers. This would help in raising the livelihood of the farmers and also help in conservation and sustainable management of *P. kurroa*. It has also been seen that due to ongoing pandemic COVID-19 tens of thousands of people have been rendered jobless and they have been forced to go back to native places where they have found it difficult to find jobs. If they are encouraged towards the cultivation of medicinal plants, it may help them in generating new revenue resources and providing them with optional finance generating avenues.

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Fig.3 Cultivation of *P. kurroa* in Himachal Pradesh



## Future Prospect of Medicinal and Aromatic Plants (MAPs)

**M**edicinal and aromatic plants (MAPs) are economically important and have major impact on the health of human. From ancient times, MAPs have been used for treating various diseases, used as flavouring agent in food and have religious value. Secondary products of the MAPs have also been used as antibacterial, antifungal, and antiviral agents. Because of the presence of bioactive compounds on these plants. It can be concluded that medicinal plant played a major role in development of nation's wealth and health. The contribution of MAPs is also remarkable in pharmaceutical industry for the production of human health products. In the medical domain drugs are important chemical ingredients and are also derived from the plants. Human are continuously in the path of exploring the herbal medicines for curing the diseases and even also the pandemic. Now a days more than 50% of natural drugs are being used for the medication purposes (Fabricant and Farnsworth, 2001; Yarnell and Abascal, 2002). The medicines extracted from the natural sources have been known for lesser side effects. The reliability of medicinal plant products has been proved to be efficient with least or negligible side effect. In India medicinal and aromatic plants have a religious value and people also worship them. In Ayurveda, importance of medicinal plants is well written and now a days peoples are continuously exploring them for the well being of mankind.

The technological advancement pave the way for development of new drugs and even traditional sources are the important one for treating various disorders because many phytochemical can not be prepared by the synthetic method. The application of medicinal plants remedies is ever increasing in developed countries. According to World Health Organisation more than 80% of peoples believe on traditional medicines. Almost 2/3 of worlds population is dependent on the traditional medicine for the healthcare. The traditional therapies by plant as written and described in Ayurveda is commonly practised in India (Singh and Bhatt et al., 2003). As the demand of medicinal plants for the purpose of medicines is increasing, the cultivation is done in laboratory condition for the faster and rapid propagation with desirable traits. Plant tissue culture is now being an emerging field for *in vitro* propagation of plants with well monitored conditions. Medicinal plants derived drugs entered in the market, promising a shorter and cheaper production, because the basal needs to use medicinal plants do not involve strict quality control regarding the safety and

efficiency compared to the other types of drugs (Neiro et al., 2010). The diverse climatic condition of the region and rich biodiversity may therefore provide scope to harness its maximum potential in the form of fraction of India.

**Herbal Plant in India:** There are about 45000 plants in India and 500 sp. are commonly practiced in indigenous system. Presently 90% of sp. is available for the screening. Indian biodiversity is rich in medicinal plants as it contributes 7% of worlds biodiversity. The Ayurvedic and Unani medicines formulations are totally plant based with long lasting effect.

**Herbal Plant in Pharmaceutical Sector:** In the present time the search of active bio-compounds has become an integrated part of the research carried out by the large pharmaceutical industries. Metabolites with medicinal properties are turned into the commercial product known as bioprospecting. About one fourth of worlds plants have been tested for their medical attributes and it is very cumbersome and tedious process to explore all the plant with the medicinal properties. So, research carried out by pharmaceutical companies using the knowledge of ancient peoples and by their literature.

**Herbal Plant in Medical Sector:** As plants synthesise numerous chemical bio-active compounds including defence against the various microorganism. These phytochemicals with potent biological activity have been identified by the researcher for the medical purposes. Medicinal plants are widely used because they are readily available and less expensive than modern medicines.

In Transcriptomics Database, the knowledge of medicinal plants is well systematised. The various secondary metabolites produced by plants are alkaloid, glycosides, polyphenols, terpenes and many more has already been reported.

**Herbal Plant in Food Industry:** In the modern times medicinal plants as a supplements have been revolutionized in the food sector. *Allium* species consumption reduces the risk for gastric cancer and also Garlic and its bioactive compounds (Allicin, Diallyl Disulphide, Diallyl Trisulphide) has also been used as a chemo-preventive agent for lung and breast cancer. Oral administration of white and red ginseng reduce the colon carcinogenesis by DMH (1,2 Dimethylhydrazine).



### **Future aspect of Medicinal and Aromatic Plants**

The demand of plants products in Medicinal sector is increasing, researchers are been paying attention on their importance. It is well written in the Ayurveda that plants therapy is best to get rid out of diseases. Herbal plants product is been used in the cosmetics, medicines, foods etc. Metabolites of Neem plant is well used in the face washes, metabolites of Babool plant is used for relieving pain from dental problems and also plague and cavities like problems. Therefore, the reliability of Herbal Plants metabolities is much more than artificially synthesised or microorganism derived chemical compounds.

### **Promoting Medicinal and Aromatic Plants**

Medicinal and Aromatic Plants are the source of cash income for the livelihood and also for staying fit and healthy. Various products of these plants are used in the daily life. Due to the lack of correct information and awareness among peoples these plants are declining. Awakening the peoples about

these plants will encourage them for their cultivation. Establishment of herbal product based companies in their areas can provide solutions to the problems.

As we are a part of nature therefore one must use the herbal plants as there are lesser side effects of them, they are safe and commonly available. Hwoever, it is important to promote the medicinal plant that can be useful for preventing diseases as well as this pandemic like situation. Medicinal plants are the mark signature of reliability in comparison to the synthetic products and drugs due the practice of medicinal plant in prehistoric times. So, its time to aware the mankind about the importance of Medicinal plants and their conservation as the plants also plays role in the development of culture globally.

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## Promotion of Medicinal and Aromatic Plants (MAPs) cultivation: An opportunity for livelihood improvement of rural communities under COVID-19 pandemic

**M**edicinal and Aromatic Plants has a long history of uses as traditional medicine, and play an imperative role for treating many ailments. From past two decades, World Health Organization (WHO) has been working with countries having long exposure of traditional medicines, and assigned the responsibility of many research institutions for the validation of traditional medicines in terms of their safety and efficacy for the treatment of COVID-19 pandemic. In Indian context, role of MAPs in treating various ailments is mentioned in ancient scriptures, but still majority of the population relies on herbal medicines. The demand of raw material is increasing, however the production/cultivation of MAPs is limited and supply chain is incapable to fulfill the demand. Therefore, there is a need to promote cultivation of MAPs in the Himalayan region so that pressure on these resources could be reduced.

Government of India took the major initiative for promotion of MAPs cultivation and through National Medicinal Plant Board (NMPB) has initiated various subsidized schemes to support MAPs cultivation by adopting good agricultural practices, individual farming, cluster farming, nursery establishment and value addition, etc. Further, to make the sector more proficient to strengthen the quality standards in herbal products, an independent Ministry of AYUSH was formed by GoI, in 2014.

Indian Himalaya, is a global biodiversity hot spot, and 1748 species have been recognized for their medicinal uses. Moreover, 700 medicinal plant species are being used by pharmaceutical industries of which about 50% species are from the Himalayan region. Within the Himalaya, the Western Himalaya (Jammu & Kashmir, Ladakh, Himachal Pradesh and Uttarakhand) is a rich repository of MAPs.

The Himalayan MAPs have always been the potential to act as an engine of progress for rural development. For instance, several Himalayan species (MAPs) viz., *Aconitum heterophyllum*, *Allium starcheyi*, *Angelica glauca*, *Carum carvi*, *Fritillaria roylei*, *Picrorhiza kurrooa*, *Dactylorhiza hatagariea*, *Nardostachys jatamansi*, *Paris polyphylla*, *Swertia chayrita*, *Trillium govavanium*, etc., are fetching high premium in the market and NMPB is providing 70% subsidy for cultivation. However, instead of various central and state level schemes, cultivation sector is not too strong in the Uttarakhand state, and about 90-95% trade of MAPs

are operated from wild through destructive approach. In the current scenario under COVID-19 pandemic, promotion of MAPs cultivation can therefore play an imperative role for strengthening of rural economy as well as conservation of the natural habitat. During the COVID-19 pandemic, approximately 2.5 lakh people's return back from each and every corner of the country to their homes in Uttarakhand. This pandemic snatched employment of many people and now they are searching for jobs. Meanwhile, to make India as a self-reliant nation, the Prime Minister of India Sh. Narendra Modi recently given the slogan 'Atmanirbhar Bharat', he emphasized the assistance of Rs 4,000 crore for 'herbal medicine corridor' at the banks of river Ganga (barren land) for generating job securities to counter the COVID-19 pandemic situation. This is therefore, an opportunity to strengthen this sector.

As such, the communities of high altitude areas are already engaged in the cultivation of several high value MAPs from last 15-20 years, especially in Uttarakhand. There are several examples of cluster farming (MAPs) established by the progressive farmers of Ghaise, Ghat Ramni and Tolma village of district Chamoli, Ushada and Triyuginarayan village of district Rudraprayag, Chaudas and Johar valley of Pithoragarh district and Kapkot village in district Bageshwar and getting economic benefit (Fig 4). In spite of the fact, various challenges are being faced by the farmers for the cultivation of MAPs:

1. Long gestation period in majority of species, make it difficult to convince the farmers about the benefits of cultivation of these species.
2. Lack of appropriate agro-techniques for these species decreases farmer's interest towards cultivation.
3. Lack of Quality Planting Material (QPM) is the major bottleneck in the promotion MAPs cultivation sector.
4. Lack in dissemination of appropriate information about subsidized schemes, generating awareness and hands on trainings for interested farmers/growers.
5. Lack of marketing and value addition at local level is the main hurdle to make farmers produce more profitable.

However, various research organizations viz., Herbal Research and Development Institute (HRDI), High Altitude Plant Physiology Research Centre (HAPPRC), GB Pant National Institute of Himalayan Environment (GBPNHE),



Fig 4. **Various activities on medicinal plant cultivation:** (a) Sensitization and awareness campaign for promotion of MAPs cultivation in Chaudas valley; (b) Land preparation activity; (c) Cultivation of *P. kurrooa* at Ghaise village; (d) Cultivation of *Allium stracheyi* at Tolma village in Chamoli district

National Bureau of Plant Genetic Resource (NBPGR), Vivekanand Krishi Anusandhan Sansthaan (VPKAS), Centre for Aromatic Plants (CAP), Forest Research Institute (FRI), Wildlife Institute of India (WII), Defence Research and Development Organization (DRDO) etc. are actively working in the MAPs sector and committed for the implementation of their research applications at ground level. Therefore, concerning agencies are required to strengthen the bridge of convergence among farmers/growers so that conservation of species in their natural habitat can be promoted. This can be done by means of:

- Sensitization and awareness campaign at village level.
- Production of quality planting material through germplasm repositories/nurseries.

Establishment of farmer's facilitation center at block level.

Creation of MPCA and MPCDA models in MAP rich areas near by the villages

Establishment of buy back mechanism and market linkages should be developed in which grower/cultivator, facilitator and trader should be involved.

Simplification in the process of registration, license, permit and exist pass, etc.

Set up of small scale industry at village level for formulation/preparation of value added products.

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## Development of herbal based medication for COVID -19: A participatory approach for sustainable development

**N**ovel Corona virus (COVID -19) also known as Severe Acute Respiratory Syndrome-related Coronavirus 2 (SARS-CoV-2) is an infectious viral disease has been declared pandemic worldwide. According to World Health Organization (WHO), COVID-19 spreads through direct as well indirect (contaminated object/surfaces) contact. It is usually transmitted via droplets or aerosols through coughing and sneezing. Common symptoms of COVID -19 include fever, headache, dry cough, tiredness and difficulty in breathing. Unfortunately, there is no efficient and approved medicine or vaccine is developed yet for this disease, however a number of preventive measures are being followed to reduce the outbreak such as washing hands frequently, using face mask, avoiding direct contact to face and eyes, maintain social distancing, use of alcohol based hand sanitizer, etc. Besides, some traditional practices are also being implemented to prevent COVID-19 infection such as consumption of herbal tea and decoction (Kadha) made by various herbal plants including zinger (*Zingiber officinale*), tulsi (*Ocimum sanctum*), black pepper (*Piper nigrum*), lemon grass (*Cymbopogon citrates*), rosemary (*Salvia rosmarinus*), Giloy (*Tinospora cordifolia*), etc. All this plants are used to treat general illness, fever, cough and cold from ancient time in India. It is also realized that consuming citrus fruits (vitamin- C rich) are highly effective in curing COVID-19 infection. Healthcare workers, scientists, doctors, researchers are continuously making efforts in search of reliable and effective vaccine or medicine as well as determination of source, structure, molecular morphology, modes of action of this virus inside the target cell.

The officials of China claimed that three patent herbal drugs namely Lianhuaqingwen capsules, Jinhuaqinggan granule for mild symptoms and Xuebijing (injectable) for severe condition recommended for prevention of COVID -19 symptoms such as fever, cough and fatigue, showed inhibitory effect (Press conference in China on 14th April, 2020). In India Patanjali Ayurveda Limited developed herbal drug kit includes Divya Coronil Tablet, Divya Swasari Vati and Divya Anu Tail to cure COVID-19. It is claimed by Baba Ramdev, during clinical trial 69 % patients tested negative in just three days and 100% recovery was reported within 7 days. Its effectiveness is due to the presence of its herbal ingredients (Fig 5) such as Giloy (*Tinospora cordifolia*), Tulsi (*Ocimum sanctum*), Ashwagandha (*Withania somnifera*), Amaltas (*Cassia fistula*), Bhoringraj (*Eclipta alba*), Black

Pepper (*Piper nigrum*). All these plant species are reported to have many pharmacological activities such as anti oxidant, anti cancer, anti microbial, anti inflammatory, anti viral and traditionally been used in various ayurvedic formulations from time immemorial to treat fever, cough, cold, asthma, bronchitis, jaundice, indigestion, cardiovascular diseases, respiratory disorders and also used to enhance immunity.

India is the third worst - hit country in terms of positive COVID-19 cases after United State and Brazil. India has reported 31,06, 349 COVID-19 positive cases and 57,542 deaths till 24 August 2020. India is being a biggest repository of medicinal and aromatic plants used by indigenous communities for curing different ailment. The base line of Indian Medicinal System is Charak Samhita (1000-800 BC) by Maharshi Charak and Shushrut Samhita (800-700 BC) by Maharshi Shashurut. Maharshi Charak mentioned over 500 and Shashurut Samhita cites 760 medicinal plants used in production of herbal medicine. As many as 80% populations of the world countries depend on Traditional Health Care System (THCS) to meet their primary health care needs because of their safety, efficacy, cultural acceptability and lesser side effects. WHO also acknowledged the uses of herbal medicine and giving opportunities for innovations around the world including repurposing drugs, traditional medicines and developing new therapies in the search for potential treatments for COVID-19. Some medicinal plants (*Rosa nutkana*, *Amelanchier alnifolia*, *Isatis indigotica*, *Taxillus chinensis* etc.) and their isolated compounds like luteolin, -sitosterol, theaflavin, saikosaponins B2, curcumin and many others investigated to have antiviral activity against different coronavirus strains such as SARS-CoV, Bovine coronavirus (BCV), SARS-CoV (Hong Kong strain).

As traditional herbal medicines provides information on the usage of plant or plant parts accumulated during the course of centuries in the healthcare systems and are still being used for treating many disorders because of its easy availability in nature and fewer adverse effects compared to synthetic drug so it is gaining popularity across the world. In present scenario when the whole world is suffering from the unexpected COVID pandemic situation it is necessary to promote MAPs for development of safe, cost – effective anti viral medications with minimal side effects. The therapeutic potency of MAPs is due to the presence of secondary metabolites or bioactive compounds such as phenolics,



Fig 5. (A). *Cymbopogon citrates* (B). *Salvia rosmarinus*, & (C). *Ocimum sanctum*

flavonoids, tannins, terpenoids, alkaloids that exert diverse biological activities including anti viral. Therefore scientists, researchers and other healthcare workers need to be encouraged for identification, isolation, and characterization of anti viral compounds that could be used to control the pathogenic effect of corona virus.

Due to the outbreak of COVID -19 many peoples who were residing in cities for employment migrated back to their native places and facing problems of livelihood securities. This is a challenging situation for the country to fulfill the daily requirements of the citizens. To overcome this situation strategies needs to be implemented for cultivation of MAPs and fruit plants having rich source of vitamins, minerals, nutritional and natural anti oxidants. National Medicinal Plant Board (NMPB) has been established by Gov. of India promote conservation and cultivation of high value medicinal plants and support policies and programs for trade and export of the produce. So MAPs cultivation could be a better option for sustaining livelihood opportunities of migrant workers also the large scale cultivation of MAPs can fulfill the demand of raw material required by the pharmaceutical industries. In this situation when whole word is facing challenges to fulfill financial, food and health securities there is an urgent need to come together farmers, researches, institutions, policy makers and planners to combat this alarming situation for sustainable development.

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## Astavarga Plants: as immunomodulatory herbs for prevention of COVID-19 Pandemic

**A**yurveda is based on a holistic view of treating an individual by understanding the interplay between the body, mind and consciousness. An Ayurveda practitioner can help the patient restore balance with diet and lifestyle changes. Balanced lifestyle and diet prevents 80% of all chronic disease. The Ayurvedic system of medicine gives the concept of immunomodulation by the term Rasayana. The Astavarga plants (Fig. 6) such as Kakoli, Kshirakakoli, Meda, Mahameda, Jivak, Risbhaka, Riddhi and Vridhi valued in Ayurvedic Rasayana (Rejuvenator) for their therapeutic potential, which have been scientifically investigated with promising results. Astavarga is nature's most extravagant group of flowering plants found in Himalayan region. As the name Astavarga indicates it contains eight medicinal plants belonging to family Asparagaceae, Liliaceae, Orchidaceae and Zingiberaceae. These plants are the main constituent of various Ayurvedic preparations like Chyawanprasha Rasayan, Ashtavarga Churna, Brimhani Gutika and Vajikara Ghrita, etc. These formulations act as immunomodulatory and can help to increase immunity against COVID 19.

**Kakoli, (*Roscoeia purpurea* Sm.);** Family: Zingiberaceae is known by erect, leafy, glabrous herbs, upto 30 cm tall with sessile leaves and purple flowers in terminal spikes. The plant bear flowering and fruiting in July to October. It is commonly found in grassy slopes of montane forests of Himalaya, Garhwal to Khasia hills. Dried powder of leaves used in wounds and cuts of cattle; plant extract as a tonic. Rhizome powder is effective in the treatment of asthma and bronchitis.

**Ksira-Kakoli, (*Lilium polyphyllum* D. Don);** Family: Liliaceae Annual or perennial herbs upto 1.5 m tall with alternate, lower whorled, lanceolate to linear-lanceolate leaves. Flowers pendulous, fragrant white within with purple streaks. The bulbs powder is used to treat cough, bronchitis, vitiated conditions of pitta, semen related weakness, strangury, burning sensation, polydipsia, hypertension, intermittent fever and general debility.

**Jivaka, (*Crepidium acuminatum* (D. Don) Szlach);** Family: Orchidaceae

Terrestrial herbs, upto 25 cm tall with base bulbous and covered by old leafy scales. Leaves 3-4, ovate- lanceolate, membranous. Flowers pale-green tinged purple, shortly stalked, on many flowered spikes. Capsules ovoid. The

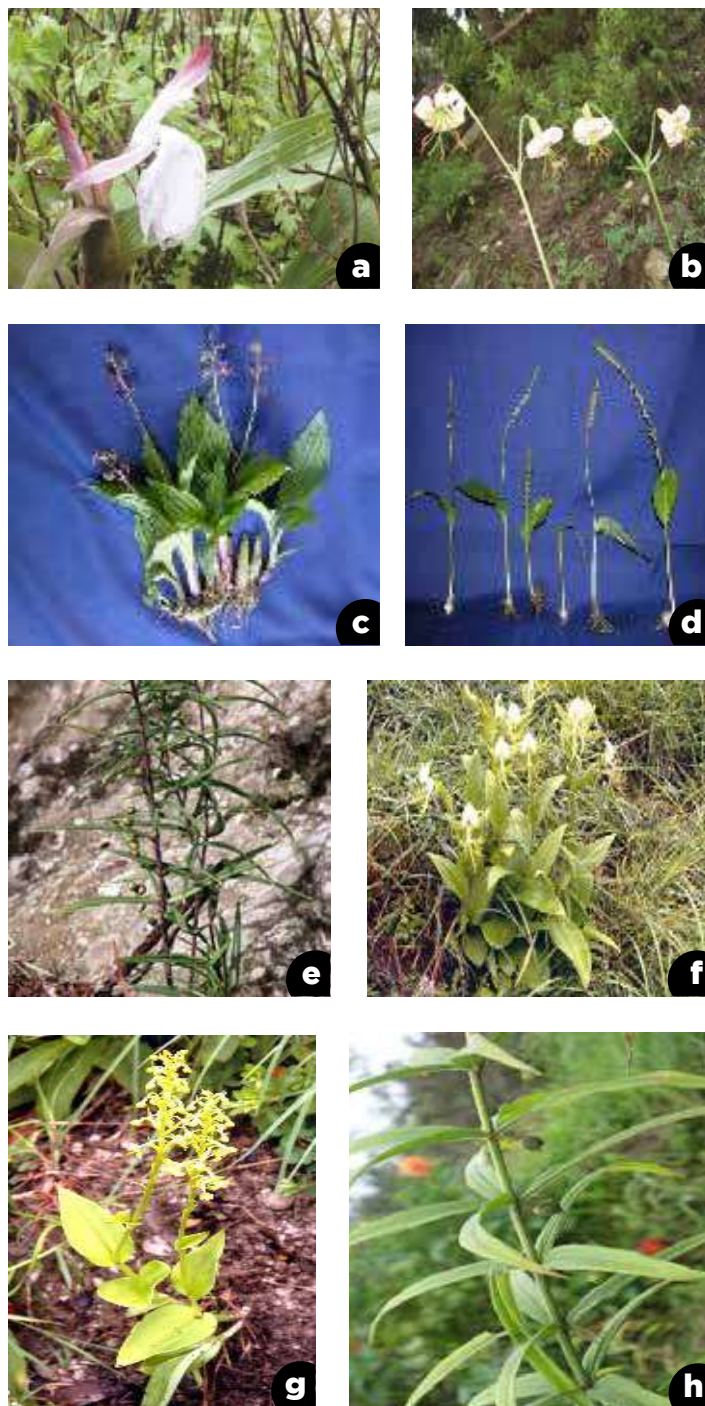


Fig 6. Astavarga plants: (a) *Roscoeia purpurea*, (b) *Lilium polyphyllum*, (c) *Crepidium acuminatum*, (d) *Malaxis muscifera*, (e) *Polygonatum cirrhifolium*, (f) *Habenaria intermedia*, (g) *Habenaria edgeworthii*, & (h) *Polygonatum verticillatum*



plant bear flowering and fruiting from August-October. It is commonly found in damp and shaded forest floors in submontane to alpine Himalaya, Himachal Pradesh to Arunachal Pradesh. Bulbs are used in bronchitis, as well as given as a tonic. Intake of decoction prepared from pseudobulbs is useful in haematemesis, fever, cough, semen related weakness, burning sensation, tuberculosis and general debility.

**Risbhaka, (*Malaxis muscifera* (Lindl.) Kuntze);** Family: Orchidaceae

Erect, glabrous herbs, upto 45 cm tall, with ovoid pseudobulbs and 2, unequal, elliptic-lanceolate or ovate leaves. Flowers minute, yellowish-green, numerous in slender spikes. The plant bear flowering and fruiting from July-September. It is occasionally found in moist-shaded forest floors, grassy slopes, of montane zones, from Kashmir to Arunachal Pradesh. The underground parts used as tonic, either made into extract or dried in the form of powder. Intake of powder prepared from pseudobulb acts as aphrodisiac, haemostatic, antidiarrhoeal, styptic, antidysentric, febrifuge, cooling and tonic. Its decoction is useful in fever, emaciation, cough, rhinitis, burning sensation and general debility.

**Meda, (*Polygonatum verticillatum* (L.) All.);** Family: Liliaceae

Annual-perennial, erect herbs, upto 1 m tall with linear or narrowly lanceolate, sessile leaves in whorls of 4-8. Flowers white, arranged in terminal, whorls of leafy racemes. Berries globose, purple-black when ripe. The plant bear flowering and fruiting from June-September. It is occasionally found in moist-shaded, Oak forests of montane to alpine Himalaya from Kashmir to Sikkim. Rhizome is useful for lungs diseases, cough and other diseases.

**Mahameda, (*Polygonatum cirrhifolium* (Wall.) Royle);** Family: Liliaceae

Annual-perennial, erect herbs, upto 1.5 m tall with linear to narrowly lanceolate, leaves in whorls of 3-6 and margins enrolled, apex coiled, tendril-like. Flowers 2-4 in short stalked axillary clusters, white, tinged purple or green, of 2-4. The plant bear flowering and fruiting from June-September. It is rare and is found in moist-shady localities of montane forests of Himalaya from Himachal Pradesh to Khasi hills.

Rhizome is used for treating emaciation and general debility caused due to tuberculosis and other diseases. Its decoction is useful in cough.

**Riddhi, (*Habenaria intermedia* D. Don);** Family: Orchidaceae  
Annual, stout, erect, glabrous herbs, upto 40 cm tall with alternate, sessile, ovate-lanceolate, leaves crowded in the middle. Flowers 2-6, white or greenish-white, infloowered racemes. Capsules linear-ovoid. The plant bear flowering and fruiting from June-September. It is commonly found in montane Himalaya from Kashmir to Sikkim and Arunachal Pradesh, Meghalaya. Powdered rhizome useful in cough and cardiac diseases.

**Vridhi, (*Habenaria edgeworthii* (Hook.f. ex Collett) X.H.Jin, Schuit., Raskoti & Lu Q.Huang);** Family: Orchidaceae  
Annual plant upto 75 cm tall with ovate to ovate-lanceolate leaves. Flowers yellow and green, deflexed in bud. Powder and decoction of its tuber is used to treat fever, asthma and cough.

### Conclusion

It is evident from scientific investigation that the “Rasayanas” are rejuvenators and possess strong antioxidant and immunomodulatory activities. The traditional herbs immunomodulatory activity can form the basis for further research in the field of coronavirus. According to WHO about 70% population of the world relies upon herbal drugs, in fact herbs are the oldest friends of mankind. Ayurveda starts working on removing the toxins from the body. According to Ayurveda, toxins in the body interfere with the proper functioning of the immune system, which often leads to diseases. Usually Astavarga plants in the form of prasha, avaleha (paste), vati (tablet) and syrup is used to enhance body resistance against various viral and bacterial diseases and improve defense mechanisms of the body.

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### ***Meconopsis aculeata* Royle: Blue Poppy, an important medicinal plants of high altitude Himalayas**

Since time immemorial nature has bestowed mankind with many boons and bane. The present situation of COVID-19 is also one of them. To some extent, human nature of over-exploitation of resources is also responsible for this complex situation. This has again changed the focus of humankind to the value of herbs and herbal medicines and finding the cure of COVID-19 in our traditional medicine system. The AYUSH Ministry of India has recently released recommendations on Immunity boosting measures which are used in the Indian traditional medicine system since ages. India has a well acknowledged traditional medicine system comprising of Ayurveda, Siddha, Unani, Yoga, Naturopathy and Homeopathy. The use of herbal medicines is also mentioned in the Tibetan and Chinese medicine systems which are one of the oldest medicine system, dating back to 2500 years. The Indian Himalayas alone is home to more than 1700 species of medicinal plants.

Based on published literature and a recent survey conducted in the high altitude regions of Himachal Pradesh, more than 227 important medicinal and aromatic plants of alpine and sub-alpine areas were identified. They are used to cure number of diseases and ailments. In addition to the wide ranging ecosystem services, their value as an important biodiversity component of Himalayas and Indian traditional medicine system is highly recognized.

#### **Blue poppy, as an important medicinal plant**

Among others, *Meconopsis aculeata*, Blue poppy (Fig.7) is an important medicinal plant. The name 'Meconopsis' is derived from the Greek word 'Mecon' which means 'poppy' and it is called blue poppy because of its flower color. It was first discovered by Viguier, a French Botanist in the year 1814. Earlier, the flower was also considered as a National Flower of Bhutan. It is an endangered plant usually growing in a cool, moist and acidic soil environment at an altitude of 3200-3800m on rocky slopes. Himalayas' soil consists of all these qualities that nurture Poppy flowers well in this region. These deep blue flowered thorny perennials grow tall around three to five feet, and have hairy leaves. This enchanting flower creates a spectacular show in mid-July to August. Himalayan Blue Poppy looks like an ornament that gorgeously decorates alpine meadows.

Traditionally, Blue poppy has been used in Tibetan medicine where it is considered to have a bitter taste and a cooling



Fig 7. *Meconopsis aculeata* Royle near Rohtang Pass, Himachal Pradesh.

potency. Analgesic and febrifuge, it is used to help heal broken bones, to treat inflammation from fractures and pain in the upper bodily region, especially around the ribs.

Phytochemical analysis of *M. aculeata* showed that the terpenoids, phlobatannins, flavonoids and alkaloids are present. The phytochemical analysis of medicinal plants is very important commercially and has great interest in pharmaceutical companies for the production of the new drugs for curing of various diseases. It is expected that the important phytochemical constituent recognized in *M. aculeata* found in Himalaya will be very useful in the curing of various diseases. Although, it is difficult to cultivate Himalayan plants, blue poppy can be through seeds.



Seed should be harvested when it is ripe, and valves at the top of a capsule open. If the capsule is dry, seeds can be shaken out of it.

Seeds do not need cleaning, but if they are mixed with other plants, seeds should be cleaned. Sieves can be helpful. Otherwise some detritus can be removed by gentle blowing, and denser seeds can be separated from less-dense material by shaking a tilted sheet of paper.

Cleaned, dry seed should be kept in labelled paper packets within a waterproof bag or container, and stored in a fridge (about 4° C), as soon as possible after harvesting.

### Conclusion

Being an important component of Indian traditional medicine system, the risk of overexploitation, endangerment and extinction of Blue poppy cannot be overlooked. About 38 species plants found in the high altitude regions of

Himachal Pradesh are listed as threatened. *M. aculeata* is also listed as an endangered species.

Around 50% of medicine in the traditional medicine system and present day pharmaceuticals are sourced from medicinal plants. There is a wide scope for using them as an alternative livelihood option for the local communities. The indigenous knowledge of the local communities inhabiting the high altitude regions of Indian Himalayas can be used to document the medicinal plants geographical distribution and their uses. The local communities can be educated and trained for proper and sustainable collection and use of medicinal and aromatic plants. It will help in reducing over exploitation by improper collection and channelizing the illegal activities related to MAPs to be an efficient livelihood option.

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## Himalayan Birch (*Betula utilis* D. Don): An Important Himalayan Medicinal Plant

Since the prehistoric times, people from different parts of the world have been utilizing plant for manufacturing herbal medicine to control infectious diseases, which might also possess anti-H CoV active extracts or compounds. Medicinal plants are boosted with diverse secondary metabolites; some of them can interrupt viral protein and enzyme activities by binding with them, and prevent viral penetration, replication into the host cells. Numerous studies have been confirmed the bioactive natural compounds which could be potential candidates treating the novel SARS-CoV-2 due to their significant antiviral activity. Currently, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), formerly known as 2019-nCoV, has rapidly spread across China and around the world. Medicinal plants are considered as rich resources of ingredients which can be used in drug development pharmacopoeial, non- pharmacopoeial or synthetic drugs. These plants play a critical role in the development of human cultures around the whole world. Approximately 60,000 plant species are used globally for medicinal purposes, of which about 28,000 have well-documented use, and approximately 3,000 species are estimated to be traded internationally, with only one-third of those known to be in the commercial cultivation. Information about the global threats to species survival is available for only 7% of medicinal and aromatic plants (MAPs); approximately 20% of these species are threatened with extinction in the wild based on the IUCN Red List criteria. Direct overexploitation, including for international trade, is among the key threats.

The Himalayan birch (*Betula utilis* D. Don), popularly known as Bhojpatra in Indian sub-continent, is one of the most important tree species across the high reaches of the Himalaya (Fig 8a). This species is distributed in sub-alpine region of the Himalayan range between 3,300 - 4,500m amsl and forms tree line all across the Himalaya. It belong to family Betulaceae. *Betula utilis* is a long-lived species, which survives more than 400 years. The timberline zones are mainly dominated by Himalayan birch and generally cover the ecotone or buffer zone between the coniferous forest zone and the sub-alpine and alpine areas. These areas have been utilized by traditional hill societies for thousands of years, providing important ecosystem services such as livestock grazing, collection of Medicinal and Aromatic plants (MAPs) and water resources. It helps to maintain the fragile ecosystem of the Himalaya by checking soil erosion and creating bio-shield for rest of the forests and

sub-alpine meadows immediately below the treeline zone. It is considered a keystone species of timberline, sensitive to climate change and grows in moist cool conditions under complex and unique habitat. Beside multiple ecological benefits, *Betula utilis* has been identified for multiple ethnobotanical importance by different ethnic and non-ethnic communities living in the Himalaya and elsewhere. About fifty species of *Betula* genus are found worldwide.

### Pharmacological Uses

According to the Ayurvedic pharmacopeia, the bark of *B. utilis* contains triterpenoids components such as betulin, lupeol and oleanolic acid-3-acetate. Therefore, the bioavailability and toxicity of the birch triterpene extracts have attracted

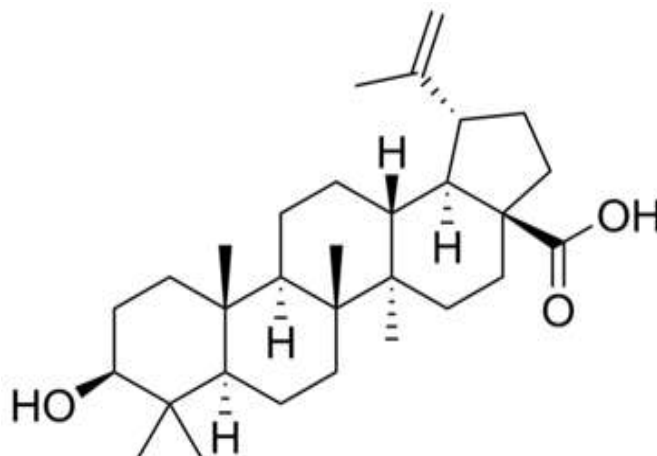


Fig 8. (a) *Betula utilis* D. Don; (b) Structure of Betulinic acid

high interest in recent years. Betulin that can be converted into the betulinic acid is obtained from *Betula utilis* (Fig 8b). Betulinic acid decreases the growth of malignant melanoma and cancer of the lungs and liver. Betulinic acid is a famous growth inhibitor of neuroectodermal, malignant tumor cells and human melanoma. The cytotoxicity of betulinic acid has been studied against neuroectodermal tumor cells including Ewing sarcoma cells, medulloblastoma, glioblastoma, and neuroblastoma. At the initial stage of the life cycle of virus many derivatives of betulinic acid have been reported to inhibit HIV. These compounds have the tendency to become a useful addition to anti-HIV therapy, which is based primarily on the enzyme's protease and transcriptase. Betulinic acid obtained from bark of *B. utilis* has antibacterial activity against some important human pathogenic bacteria like *Citrobacter sp.*, *Klebsiella pneumonia*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Proteus mirabilis*, *Salmonella paratyphi*, *Shigella boydii*, *S. sonnei*, *S. flexneri*, *Streptococcus faecalis*, and *Staphylococcus aureus*, and it also affects gram-positive bacteria. A dried, stored sample of bark of *B. utilis* was found to be active against *Aspergillus niger* and *Aspergillus flavus*. Betulinic acid obtained from the bark of *B. utilis* is found to possess potent antioxidant activity.

Inflammation is a response of the body to the cell damage by an external source. It has been reported that in the propagation of oxidation the methanolic and water extract of *B. utilis* stopped the initiation of free radicals or stopped the chain reaction. This shows that *B. utilis* is very useful in inflammation treatment. During inhibition, the activity of *B. utilis* was found to be less than lipoxygenase enzyme. By acting on free radicals, it may decrease the inflammation. Lipoxygenases are very responsive to the antioxidants, and

mostly, they play a role in inhibition of lipid hydroperoxide formation due to the scavenging of lipidoxyl or lipidperoxy radicals formed in the course of enzymic peroxidation. This can limit the availability of lipid hydroperoxide substrate necessary for the catalytic cycle of lipoxygenases.

### Conclusion

*Betula utilis* makes the basis of many biochemical compounds which possesses anti-cancerous, antioxidant, anti HIV, antimicrobial, and anti-inflammatory activities. Anthropogenic pressures including over exploitation, deforestation, overgrazing and natural calamities like erosion, snow drift, forest fire and landslides are the factors that affect the regeneration of *B. utilis*. Therefore, this species has been categorized as Critically Endangered. Development of conventional and in-vitro propagation protocols and establishment and maintenance of plantlets/seedlings in the altitudinal range of the species would help in ex-situ and in-situ conservation of the species. Proper survey and documentation will help in maintaining the growth and exploitation rate equal for the development of the conservation and management strategies.

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## Important medicinal and aromatic plants (MAPs) of Indian Himalayan Region

India is one of the mega-diverse countries with a surreal bounty of flora and fauna and accounts for 7-8% world's recorded species even though it has only 2.4% of Earth's landmass. From green coconuts in Kerala to red apples in Kashmir, India's every state treasures its masterpiece. However, the Himalayan region is uniquely blessed with some of the most medicinally and economically important plants. But with speeding urbanization, most of the native flora is on the edge to go extinct and are in a need of an urgent action to help conserve them. While the government has launched several programs to help this cause such as the National Biodiversity Mission but without the support of the natives, it will be very hard to properly exercise these causes for aide. Moreover, the outburst of the recent pandemic COVID-19 has nearly halted the economy of many countries. Many folks have lost their jobs and are now clueless about their future which is an excellent opportunity to promote the farming of medicinal and aromatic plants. These plants are not only an excellent source for generating revenue but are also important for medicine in today's world. With ever-increasing infectious diseases, these plants are quite helpful in improving immunity. The consumption of immunity-boosting herbs has also recently increased due to coronavirus. With proper awareness and capacity building from the government, the cultivation and conservation of the medicinally important plants can be accelerated. Some important medicinal & aromatic plants are briefly described in the following section:

### 1. Giloy (*Tinospora cordifolia*)

Also known as Guduchi and Heart-leaved moonseed belonging to the family Menispermaceae is climbing shrub natively found in India. It has been used in Ayurveda over centuries to treat ailments of stomach, fever and also helps in blood purification and improve immunity. Its consumption has also seen a spike after corona outbreak due to its anti-viral properties [1]. Commercially it also generates good revenue as giloy is used in synergy with other herbs to create different types of Ayurvedic medicines. Giloy while a medicinally important plant is not facing the threat of extinction as of now.

### 2. Shatavari (*Asparagus racemosus*)

Also known as satavar is a species of *Asparagus* found





all over India. It is extensively used to treat hormonal and reproductive disorders in women [2]. But because of its exhaustive use in medicines and reckless harvesting, the plant is now considered endangered in the Himalayan region. Shatavari also yields a good revenue when grown commercially, but focus should be on protecting the wild varieties that grow in the Himalayan region is needed.

### 3. Brahma Kamal (*Saussurea obvallata*)

Named after the Hindu deity Brahma, Brahma Kamal is a flowering plant belonging to the family Asteraceae. It's native to the Himalayan region and is considered a rare plant. Due to its delicate nature, strict ecosystem requirements and extensive harvesting, the plant is looming on the edge of eradication and is already endangered. Brahma Kamal is used in treating bone-ache, fever and urogenital complications [3]. Brahma Kamal is also the state flower of Uttarakhand; the state government should implement more stringent rules and regulations to protect the plant from poachers and the reckless harvesting done by locals for both medicinal and cooking purposes.

### 4. Tulsi (*Ocimum sanctum*)

Holy Basil also commonly known as Tulsi is a common herb that grows all over India. It is not endangered as of now but extensively used in Ayurvedic medicines. Pure concentrate of Tulsi extracts is readily available in the market and is widely consumed to build better immunity. Tulsi helps improve immunity and has shown great success in aiding cancer patients in clinical trials. Tulsi farming is easy, cost-effective and can be propagated through seeds and cuttings.

### 5. Lavender (*Lavandula angustifolia*)

Lavandula commonly called lavender is a flowering plant of

the mint family, Lamiaceae. Grown for its fragrant flowers and the oil that is extracted out from the lavender is an easy plant, which grows very well in the hills of Jammu and Himachal Pradesh. It's widely used in aromatherapy and the essential oil extracted is used to infuse perfumes, balms, creams and other cosmetics. The farming of the plant also yields good revenue in the end.

With accelerating modernization it is evident that both farming and plant conservation practices need to adapt and get revamped for better assimilation of the changing times. Government also needs to improve the capacity building protocols used to educate people. Most of the farmers are not aware of these high revenue crops. We need to bring a balance between the farming and the natural ecosystem. We need to implement strict laws and close monitoring for harvesting MAPs from wild.

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## Ethno-Medicinal Potential of Selected Plants of Family Zingiberaceae From Betalghat Region, Nainital (Kumaun Himalaya)

The family Zingiberaceae, is commonly known as 'Ginger family' is well-known for its medicinal values. The species of the family are distributed widely throughout the tropics, particularly in Southeast Asia. Ginger is an important natural resource, which provide various useful products such as dyes, food, medicines, perfume and spices, etc. [1,2]. The ginger family consists of 53 genera and over 1200 species [3]. India is one of the richest and diverse regions for Zingiberaceae, having 20 genera and around more than 200 species [2,4]. The family Zingiberaceae has great traditional medicinal value being utilized in various indigenous medical systems since ancient time. Many members of Zingiberaceae are used in Ayurvedic, Homoeopathic and Unani systems of medicine. Ancient Indian books on medicines named 'Charaka Samhita' and 'Susmta Samhita' illustrate the wonderful curative properties of Zingiberaceae especially *Zingiber* Boehm. and *Curcuma* Linn. due to their chemical principles. The medicinal and aromatic properties of Indian Zingiberaceae members are described in Materia Indica.

Ethno-botany has emerged as an important branch of study

which focused on the utility of different plant species and their properties as food, medicines and other uses. The aim of the present study is to document the diversity and ethno-medicinal uses of plants belonging to family Zingiberaceae from Nainital (Kumaun Himalaya) with authentic scientific name, vernacular name and ethno-medicinal uses for further research.

### Diversity and ethnomedicinal uses

Six sites (Digthari, Dhunikhal, Garamapni, Kanda, Niglaat and Pangkatara) of Betalghat block of district Nainital were surveyed for identification of plants. Extensive field visits were conducted and local inhabitants were interviewed to generate authentic information. The herbarium were prepared and identified with the help of the relevant floras.

A total of 07 species with 06 genera of family Zingiberaceae were recorded from different sites. The documented plant species have been enumerated along with their vernacular names, altitudinal range (m) and flowering and fruiting time (Table 1). The ethno medicinal uses of the species were also

**Table 1. Diversity and Ethno-medicinal Uses of Family Zingiberaceae, Nainital (Kumaun Himalaya)**

Vernacular Name	Botanical Name	Altitudinal Range (m)	Flowering & Fruiting	Part Use	Ethno-medicinal uses
Kachur	<i>Cautleya spicata</i> (J. E. Sm.)	1300-1800	Jul-Oct	Rhizome	Paste of rhizome is used as antiseptics for burns, cuts and wounds
Haldi	<i>Curcuma domestica</i> Valetton	700-1800	Apr-Jun	Rhizome	Paste of rhizome is used as antiseptics for cuts and wounds. One table spoon of Turmeric with warm milk cures bronchial asthma and cough
-	<i>Globba racemosa</i> Sm.	700-1500	Jun-Nov	Rhizome	Powder of rhizome is used in stomach ache
Ban Haldi	<i>Hedychium spicatum</i> Buch.-Ham. ex Sm.	1300-2000	Jul-Oct	Rhizome	Powder of rhizome is used in asthma, headache and stomach ache
Kakoli	<i>Roscoea purpurea</i> J.E. Smith	1300-2000	Jul-Aug	Root	Decoction of root is used in jaundice
Adrak	<i>Zingiber officinale</i> Roscoe.	700-1800	Jul-Oct	Rhizome	Juice of rhizome is used in cough, cold and asthma
-	<i>Zingiber roseum</i> Roxb.	900-1400	Aug-Oct	Rhizome	Juice of rhizome is used in fever, jaundice

enumerated from different people.

Present study reveals that the traditional knowledge about various plants is only limited to old people. The younger generation do not have knowledge about the plants and their utilization. There is need to develop awareness as well as interest in younger generation about the uses of forest resources or natural resources. To achieve this awareness goal one should try to develop management plans, that can provide employment to the local young inhabitants and develop interest towards sustainable cultivation and conservation of this valuable natural wealth.

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## Kamru Nag Sacred Groves a Repository of Medicinal Plants in Himachal Pradesh, North Western Himalaya

The word sacred means considered to be holy or “Connected with a God” and the word grove means a small area of land with particular type of vegetation. Thus, by combining these two words the final dictionary meaning of the couple of the word’s Sacred Grove i.e., a small area of land with particular types of vegetation and that considered to be holy by the local human community. The study of interrelationship between the human, plants and animals in their surrounding environment is very revealing. People who living nearby the sacred groves are depend on the grove to meet their vital domestic necessities, such as fuel, fodder, religious, edibles, medicinal etc. Local laws and custom usually limit the villager’s activities in these groves. Sacred groves are one of the first instances of traditional conservation. Sacred Groves of India are forest fragment of varying sizes, which are communally protected, and which have a significant religious connotation for protecting community. Hunting and logging are usually strictly prohibited, within these patches other form of forest usage like honey collection and dead wood collection are sometimes allowed on a sustainable basis. The Sacred Groves act as reservoirs of rare fauna, and more often rare flora. Of the 13,270 sacred groves documented from India, 5,627 Sacred Groves are known from the IHR. The state Himachal Pradesh is also known as “Deobhumi” means Land of God, supports about 5,000 Sacred Groves. People of Himachal follow ancestral worship and animism in the form of deity worship, with the central focus of worship on forest patches, which signify sacred groves.

Kamrunag Sacred Grove, located between latitude 31° 28’ 16.82” N & 77° 03’ 00.63” E - 31° 24’ 16.54” N & 77° 08’ 19.82” E, Kamrunag Hills of tehsil Chachyot, district Mandi, (H.P.) house famous temple of Dev Kamrunag (‘Bada Deo), a local rain God, at an altitude of about 2,909 m (Fig 9). The place is famous for its lush green Deodar (*Cedrus deodara*), Kail (*Pinus wallichiana*). Silver fir (*Abies pindrow*), Drooping fir (*Picea smithiana*), Oak (*Quercus semicarpifolia*) and Rhododendron (*Rhododendron arboreum*) forest and alpine meadows. The region attracts a lot of devotees and tourists in summer months and during Saur Nahuli fair on 1st of Aashadha (June 13-14, every year). The place is bordered by Sunder Nagar tehsil on the west and Shikari Devi sanctuary on the east, Karsog on the south, Balh valley and Pandoh on the north. Jiuni river flows in the foothills of Kamrunag in the valley and originates near Devidarh.

The climate is temperate type in the hills and subtropical to temperate in foothills. Temple of Dev Kamrunag though made up entirely of wood is 4-sided open, and with a stone idol (Pindi) installed in the middle. The inverted heart-shaped ‘Suraj Pankh’ of Dev Kamrunag is made up of silver and gold with an inscription of Lord Vishnu. Unlike other local Gods, there is no chariot or palanquin for this deity. Dev Kamrunag is worshipped whenever there is draught or flood in the region. This tradition is still in practice. During famous Shivratri fair of Mandi, Dev Kamrunag (‘Bada Deo’) doesn’t visit himself but its representative is sent there and given highest place and respect. On fulfillment of ones wishes Gold and silver ornaments are offered in the Sacred Kamrunag lake to appease the deity. As there is no motorable road, devotees visit Kamrunag shrine by trekking over a steep vertical slope of about 8 km from Rohanda (a place on Mandi-Karsog road about 70 km from Mandi town) or from Chailchowk, Jachh and Devidarh.



Fig 9. Kamrunag Sacred Grove in Himachal Pradesh



Fig 10. *Angelica glauca* in Kamrunag Sacred Grove

Sacred groves have survived for many hundreds of years and today act as treasure store of much local biodiversity.

People who are living nearby the Kamru Nag sacred groves are depend on the grove to meet their vital domestic necessities, such as fuel, wood, edible, timber, religious, medicinal, etc. Some medicinal plant including *Achyranthes aspera*, *Angelica glauca*, *Arisaema jacqmontii*, *Ajuga bracteosa*, *Berberis aristata*, *Codonopsis ovata*, *Hypericum perforatum*, *Skimmia laureola*, *Valeriana hardwickii*, *Viola biflora*, *Taxus wallichiana*. The inhabitant made the number of preparations from medicinal plant species, which produce better results in improving the health. Dried plant material of *Achyranthes aspera* boiled in water is given to reduce fever. Roots of *Angelica glauca* (Fig. 10) are used as spice and condiment and decoction of root is used in obstinate constipation and biliousness. Decoction of root bark of *Berberis aristata* mixed with honey is given in jaundice. Taxol obtained from the leaves of *Taxus wallichiana* is reported to cure uterine and breast cancer. Rhizomes and flowers of *Hedychium spicatum* mixed, crushed and given orally as an antidote in food poisoning, also the paste of rhizome applied on skin to cure boils.

The leaves of *Habenaria pectinata* are crushed and applied as paste in snake bites. Its tuber is mixed with khoya and cardamom and eaten to get relief from joint pains. Some

plant used as fodder species including *Acer acuminatum*, *Quercus semecarpifolia*, *Sarcococca saligna*. etc. *Abies pindrow*, *Taxus wallichiana*, *Picea smithiana* are used as a source of timber and house building. The people used the leaves of *Skimmia laureola* for 'Havan' for religious purposes, scented fumes purify the atmosphere. In Kamrunag Sacred Grove, some species have multipurpose utility. For example, *Skimmia laureola*'s dried leaves when burnt with desi ghee on red hot coal, emit out highly scented fumes which purify the atmosphere. The purple berries are sweet in taste and are administered to the fever. *Taxus wallichiana* is used for medicinal, fuel, timber and religious purposes; *Asparagus filicinus* for medicinal and religious. *Berberis aristata* for medicinal, edible and fuel; and *Saccococca saligna* for fodder, fuel and religious. However, it was noted that there is no plant without any importance, and can be used for food, medicines and construction of houses.

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## मांसी: महत्वपूर्ण एवं विलुप्तप्राय औषधीय एवं सगन्ध पादप

**हि**मालय में हिम शिखरों की तलहटी में जहाँ टिम्बर रेखा (यानी पेड़ों की पंक्तियाँ) समाप्त होती हैं। वहाँ से हरे मखमली घास के मैदान आरम्भ होने लगते हैं। आमतौर पर आठ से दस हजार फीट की ऊँचाई पर स्थित इन ढालदार मखमली घास के मैदानों को उत्तराखण्ड हिमालय में बुग्याल कहा जाता है।

बुग्याल हिम रेखा और वृक्ष रेखा के बीच का क्षेत्र होता है। स्थानीय लोगों और मवेशियों के लिए ये चरागाह का काम तो करते ही हैं। बंजारों, घुमन्तुओं और ट्रेकिंग के शौकीनों के लिए कैम्पसाइट का काम भी करती हैं। सर्दियों में जब इन मखमली ढालदार मैदानों पर बर्फ की सफेद चादर बीछ जाती है तो ये बुग्याल स्कीइंग और अन्य बर्फानी खेलों का अड्डा भी बन जाते हैं। बरसात में नहाए वातावरण में इन बुग्यालों में हरियाली छाई रहने के साथ ही भाँति-भाँति के फूल एवं बहुमूल्य औषधीय वनस्पतियों ढालों, चट्टानों पर विभिन्न प्रकार के घासों के साथ रंगत बिखेरी हुई उगी रहती है। इन्हीं औषधीय वनस्पतियों में से एक है मांसी यानि जटामांसी।

वैलिरियेनेसी कुल के अन्तर्गत आने वाले इस सपुष्पीय औषधीय एवं सगन्ध पादप जटामांसी को वैज्ञानिक जगत में *नाडोस्टेकिस जटामांसी* या *ग्रन्डीफ्लोरा* (*Nardostachys jatamansi* अब *grandiflora*) के नाम से जाना जाता है। इसका उपयोग तीक्ष्ण गन्ध वाले इत्र को बनाने में होता है। इसे जटामांसी इसलिए कहा जाता है क्योंकि इसकी जड़ों में जटा (साधु की जटाओं/बाल) जैसे तन्तु लगे होते हैं। हिमालय में शंकर भगवान का वास होने के कारण इसको शिव से जोड़कर भी देखा जाता है। व्यवसायिक तौर पर स्पाइकनार्ड के नाम से जाने जाने वाले इस प्रसिद्ध आयुर्वेदिक जड़ी-बूटी को न्यूरो मनोवैज्ञानिक विकारों और त्वचा रोगों को ठीक करने के लिए जाना जाता है। इस जड़ी-बूटी के जड़ों से प्राप्त तेल का उपयोग इत्र और दवा के रूप में किया जाता है।

जटामांसी एक शाकीय (हर्ब, जड़ी-बूटी) एवं बहुवर्षीय प्रवर्ती का औषधीय एवं सगन्ध पादप है। इसका जमीन से ऊपर (पत्तों) वाला भाग औषधि नहीं माना गया है। जबकि धरती के नीचे वाले भाग (हेयरी जड़) को औषधि निर्माण/उपभोग के लिए उपयोगी माना गया है। प्राचीन आयुर्वेद ग्रन्थों में भी जटामांसी का वर्णन तथा महत्व बतलाया गया है। बताते हैं कि बाबर ने जिन हस्तलिखित ग्रन्थों की रचना की उनमें भी जटामांसी का वर्णन किया गया है। जटामांसी को ही भूतजटा तथा तपस्वी नाम भी दिए गए हैं। माना जाता है कि धर्मों या घरों में जटामांसी के पंचांग से बने धूप का अर्ग देवताओं को दिए जाने से मनोकामना पूर्ण होती है। इसका जिक्र फार्मकोपिया औषधि विज्ञान में भी पाया गया है। यह एक यूरोपीय ग्रन्थ है। जिसका नाम हिप्पोक्रेट है। अतः यह बहुत पुरानी हर्ब है। भले ही इसके नाम से आम आदमी अनभिज्ञ है लेकिन वैद्य-हकीमों द्वारा इसका खूब प्रयोग किया जाता रहा है।

जटामांसी प्रकृति से कड़वा, मधुर, शीत, लघु, स्निग्ध, वात, पित्त और कफ तीनों दोषों को हरने वाला शक्तिवर्द्धक, त्वचा को कांति प्रदान करने वाला सुगन्धित पौधा है। जटामांसी का तेल केंद्रीय तन्त्र और अवसाद (डिप्रेशन) पर प्रभावकारी होने के साथ ही जलन, कुष्ठ, रक्तपित्त (नाक, कान से खून बहना, विष, बुखार, अल्सर, दर्द, गठिया या जोड़ों का दर्द) में लाभदायक होता है। सिरदर्द के लिए जटामांसी एक उत्कृष्ट औषधि मानी गई है। इसकी जड़ों के भौमिक काण्ड में जटामेसान, जटामासिक, एसिड, एक्टीनीदीन, टरपेन, एल्कोहाल, ल्यूपियाल, जटामेनसॉन और

कुछ उत्पन्न तेल नामक रासायनिक तत्व पाए जाते हैं। जटामांसी तेल की प्रवृत्ति शीतल मानी गई है। जानकारों के अनुसार जटामांसी मानव शरीर से सम्बन्धित विभिन्न बीमारियों/विकारों के इलाज में काफी अधिक मददगार पाया गया है।

### जटामांसी के लाभ:-

१. मस्तिष्क और नाड़ियों के रोगों के लिए ये रामबाण औषधि है। ये धीमे लेकिन प्रभावशाली ढंग से काम करते हैं। तंत्रिका तन्त्र में हार्मोन के सन्तुलन को बनाए रखने से पागलपन, हिस्टीरिया, मिर्गी, नाड़ी का धीमी गति से चलना, मन बेचैन होना, याददाश्त कम होना इन सारे रोगों की यही अचूक दवा है। ऑक्सीडेटिव तनाव के खिलाफ मजबूत सुरक्षा भी प्रदान करता है।

२. कान के पास गम्भीर या तेज दर्द जैसे सिरदर्द के लिए एक प्रभावी समाधान, आँख और चरम के चारों ओर तीव्र दर्द समी वटज शिरोशूल (प्रमुख वाटा के साथ सिरदर्द) के लिए अच्छा काम करता है।

३. स्मृति में सुधार करने की जटामांसी की क्षमता अदभूत है तथा यह यह आयुर्वेदिक जड़ी बूटी स्मृति हानि से पीड़ित लोगों के लिए एक वरदान सिद्ध होती है। यह उन लोगों के लिए भी लाभदायक है जो अक्सर मानसिक तनाव में रहते हैं जबकि विद्यार्थियों के सीखने और अन्य संज्ञानात्मक कार्यों में जटामांसी के सेवन से सुधार आता है।

४. जटामांसी व्यक्ति की तनावपूर्ण परिस्थितियों को झेलने की क्षमता में वृद्धि करती है तथा अवसाद से लड़ने में मदद करती है। यह गैबा (गामा एमिनोब्यूटिक एसिड) के स्तर को बढ़ाकर एक रसायन जो न्यूरोनल उत्तेजना कम करता है और मांसपेशी टोन को नियन्त्रित करता है। इस प्रकार जटामांसी आक्रामकता, हिंसक और आत्म विनाशकारी व्यवहार और क्रोधित विस्फोट को कम कर देती है।

५. तिल के तेल की भाँति जटामांसी का तेल भी बालों एवं त्वचा के लिए लाभदायक माना जाता है। तिल के तेल में उपस्थित संसाधित नार्ड बालों को समय से पहले झड़ने को कम करने में मदद करता है। इस तेल से बालों की चमक बने रहने के साथ ही यह डेनड्रफ को नियन्त्रित करने में भी सहायक होता है। इसी प्रकार जटामांसी का तेल त्वचा को चमकदार यानि त्वचा की टोन और बनावट को बदल देता है।

६. जटामांसी डिस्मोनोरिया के उपचार, चिंता तथा रक्तचाप को कम करने में भी सहायक सिद्ध होती है। ये त्रिदोष को भी शान्त करती है और सन्निपात के लक्षण समाप्त करती है।

७. जटामांसी के काढ़े को प्रतिदिन पीने से आँखों की रोशनी बढ़ती है।

८. चर्म रोग (सोरायसिस) में भी इसका लेप लाभ पहुँचाता है।

९. नारियों के मेनोपॉज के समय तो ये सच्ची साथी की तरह काम करती है।

१०. इसका शरबत दिल को मजबूत बनाता है और शरीर में जमें हुए कफ को बाहर निकालता है।



११. मासिक धर्म के समय होने वाले कष्ट को जटामांसी का काढ़ा कम करता है।  
१२. इसे पानी में पीस कर लेप कर देने से सर और हृदय दोनों का दर्द समाप्त हो जाता है।

१३. इसको खाने या पीने से मूत्रनली के रोग, पाचननली के रोग, श्वसन नली के रोग, गले के रोग, आँखों के रोग, दिमाग के रोग, हैजा, शरीर में मौजूद विष नष्ट होते हैं।

१४. अगर पेट फूला हो तो जटामांसी को सिरके में पीसकर नमक मिलाकर लेप करें तो पेट की सूजन कम होकर पेट सपाट हो जाता है।

१५. मौसम बदलने पर बच्चों से लेकर बड़े-बूढ़ों सबको खांसी की शिकायत हो जाती है। मनशिला, हरताल, मुलेठी, नागरमोथा, जटामांसी तथा इंगुदी से ध्रुमपान करने के बाद गुड़ युक्त गुनगुने दूध का सेवन करने से खांसी से राहत मिलती है। इसके अलावा जटामांसी का शर्बत बनाकर पिलाने से कफ सम्बन्धी रोगों से भी राहत मिलती है।

१६. जटामांसी, काली मिर्च, सेंधा नमक, हल्दी, तगर, सेंहुड की छाल, गृह्मूम, गोमूत्र, गोरोचन तथा पलाश क्षार को मिलाकर पीसकर लेप करने से कुष्ठ रोग में लाभ होता है। इसके अलावा समान भाग में पूतिकरंज की गुद्दी, देवदारु, जटामांसी, शहद मुद्रापणी तथा काकनासा को पीसकर लेप लगाने से मण्डल कुष्ठ में लाभ होता है।

१७. जटामांसी इम्यूनिटी को बढ़ाने के लिए एक अच्छा उपाय है। जटामांसी पर हुई रिसर्च के अनुसार इसमें इम्युनोमोडुलेटर का गुण पाया जाता है। इसलिए इसका प्रयोग इम्यूनिटी को बेहतर बनाए रखने के लिए भी किया जाता है।

१८. जटामांसी का प्रयोग कैंसर से बचाव में भी किया जा सकता है क्योंकि एक रिसर्च के अनुसार जटामांसी में कैंसररोधी तत्व पाए जाते हैं। इसलिए जटामांसी का प्रयोग कैंसर को फैलने से रोकने में भी सहायता करता है।

१९. जटामांसी का चूर्ण आपकी पाचन शक्ति को भी अच्छा रखने में सहायता करता है। यदि आपको कब्ज है तो इसके सेवन से उसमें आराम मिलता है क्योंकि इसमें लैक्सटिव का गुण पाया जाता है।

२०. जटामांसी तनाव को दूर करने की एक जानी मानी औषधि है। आयुर्वेद के अनुसार इसमें मेध्य का गुण पाया जाता है। जिसके कारण जटामांसी का सेवन तनाव के लक्षणों में कमी लाता है।

इतनी खूबियों एवं सुन्दरता को संजोए रखने के बावजूद भी जटामांसी इसके प्राकृतिक वासों खासकर उत्तराखण्ड हिमालय से विलुप्ति की कगार पर खड़ा है। हर्बल फार्मेशियों/कम्पनियों में मांग होने के कारण इसके लाभकारों द्वारा इस पौधे की जड़ प्राप्ति के लिए अवैज्ञानिक तरीकों से खोदा एवं औने पौने दामों में बेचा जाता रहा है। जिस कारण यह आज आम आदमी की पहुँच से दूर होता जा रहा है। घर गांवों में स्थानीय लोग भी इसकी जड़ों को धूप के रूप में उपयोग करने हेतु बुग्यालों से खोदकर लाते रहते हैं।

यदि सहमत हों और मिले तो स्वस्थ एवं निरोगी शरीर के लिए जटामांसी का उपयोग अवश्य करें। साथ ही उच्च हिमालय के लोगों से आग्रह है कि अधिक से अधिक मात्रा में जटामांसी की खेती कर आर्थिकी मजबूत करने के साथ ही संरक्षण का प्रयास भी करें। जिससे आने वाली पीढ़ियों को भी इन बहुमूल्य औषधीय पादपों का लाभ मिल सके। राष्ट्रीय औषधीय पादप बोर्ड (NMPB) तथा राष्ट्रीय हिमालयी अध्ययन मिशन (NMHS) भारत सरकार के वित्तीय सहयोग से हैप्रेक के माध्यम से भी उच्च हिमालय में पाए जाने वाले विलुप्तप्राय औषधीय पादपों के संरक्षण एवं कृषिकरण को बढ़ावा देने के लिए निरन्तर कार्य किया जा रहा है। किसी भी औषधीय पादप के उपयोग से साइड इफेक्ट भी हो सकते हैं। इसलिए चिकित्सा पर्यवेक्षण के तहत या सम्बन्धित डॉक्टर से ली गई सलाह के अनुसार ही औषधीय पादप का उपयोग किया जाना उचित माना गया है।

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## औषधीय एवं सगन्ध पादप: उत्तराखण्ड में वर्तमान स्थिति एवं संरक्षण के प्रयास

पुरातन समय से ही मानव अपनी आवश्यकताओं की पूर्ति हेतु प्रकृति पर निर्भर रहा है। हिमालय की विविध भू-स्थलाकृतिक विशेषताओं के कारण यहाँ वानस्पतिक संसाधनों का विशाल एवं स्थायी भण्डार चिरकाल से है। विशेष रूप से अधिक तथा मध्य ऊँचाई वाले किस्मों के अनुकूलन क्षम हेतु हिमालय क्षेत्र विख्यात है। वैसे तो हिमालय क्षेत्रों में पाए जाने वाले लगभग हर एक पेड़-पौधे का आर्थिक महत्व है। चाहे ऐसा उसके पोषण मूल्य के लिए हो अथवा सौंदर्यात्मक या औषधीय दृष्टि से मगर वर्तमान परिपेक्ष्य में अधिक आमदानी वाले महत्वपूर्ण नगदी फसलों एवं पेड़-पौधों का रोपण जरूरी हो गया है। भारत में आयुर्वेद, सिद्ध, यूनानी और होमियोपैथी चिकित्सा पद्धतियों द्वारा ६०००-७००० औषधीय पौधों के उपयोग का अनुमान लगाया गया है। औषधीय पौधों की लगभग ६०० प्रजातियाँ व्यापार में हैं जिनमें से १७८ प्रजातियाँ १०० मीट्रिक टन से अधिक की वार्षिक खपत पर उपयोग हो रही हैं।

**औषधीय एवं सगन्ध पादपों का महत्व:** औषधीय पौधे न केवल पारंपारिक औषधि एवं हर्बल उद्योग के लिए प्रमुख संसाधन आधार हैं बल्कि भारतीय आबादी के एक बड़े खण्ड के लिए आजीविका और स्वास्थ्य सुरक्षा प्रदान करते हैं। विश्व स्वास्थ्य संगठन की एक रिपोर्ट के अनुसार आज भी विश्व की लगभग ८०: आबादी विभिन्न बीमारियों के उपचार हेतु पारम्परिक ज्ञान पर निर्भर है। आज विश्व को यह बताने की आवश्यकता नहीं है कि जब किसी भी देश में किसी चिकित्सा पद्धति का कोई अस्तित्व नहीं था, तब भारतीय चिकित्सा पद्धति 'आयुर्वेद' पूर्णरूप से उन्नति के चरम शिखर पर आरुढ़ थी। उस समय आयुर्वेद की वास्तविक स्थिति का आभास इस तथ्य से सहज ही हो जाता है कि युद्ध क्षेत्र में हताहत हुए सैनिकों का तत्काल उपचार वहाँ स्थित शल्य-वैद्यों के द्वारा ही किया जाता था। बड़ी आसानी से उनके कटे हुए अंगों को जोड़ दिया जाता था। उत्तराखण्ड में तो आयुर्वेद अनादिकाल से ही यहाँ के जन जीवन में रचा बसा है यही कारण है कि छोटी-बड़ी बीमारियों के इलाज के लिए जड़ी-बूटियों से उपचार करने की परम्परा आज भी चली आ रही है। शोध विरोधी, वेदना हर, कृमिघ्न, सन्धिवात आदि रोग के उपचार लिए उपयोग में आने वाला अतीस, हृदय व मानसिक रोगों के उपचार में लालजड़ी, कुष्ठ रोग, श्वास और यकृत सम्बन्धी बीमारियों के इलाज के लिए कुटकी, अल्सर और कैंसर जैसी घातक बीमारियों के निदान के लिए वन ककड़ी, गठिया जोड़ों के सूजन श्वास आदि में अश्वगन्धा, अनिन्द्रा, हृदय, उच्च रक्त चाप, स्मृति वर्धन में जटामासी, बल एवं वीर्यवर्धक हेतु कीड़ा जड़ी, श्वेतप्रदर, पुराने ज्वर, बलवर्धक में हथाजड़ी, शरीर की दुर्बलता वात रोग, अतिसार एवं प्रदर, नपुंसकता एवं वीर्य दुर्बलता से निजात हेतु सफेद मूसली, उदर वात एवं पाचन सम्बन्धित समस्या में चोरु भी उत्तराखण्ड के हिमालयी क्षेत्रों में मिलता है। इसके अलावा गिलोय, धतूरा, डोलू, चन्द्रा, सालममिश्री, भांग, बज्रदन्ती, पाषाण भेद, कपूर कचरी, किनगोडा, चित्रक, वच, रतनजोत जैसी सैकड़ों जड़ी-बूटियों की भरमार है जिनसे बनी औषधियों ने चमत्कारिक रूप से कई लाइलाज बीमारियों को ठीक किया है।

उत्तराखण्ड में औषधीय एवं सगन्ध पादपों की वर्तमान स्थिति: वर्तमान जीवन की आपाधापी और व्यस्तता के बीच आज मनुष्य अपना अच्छा बुरा सोचने की क्षमता भी खोता जा रहा है। जड़ी बूटियों के अवैध खनन, अत्याधिक दोहन, जलवायु परिवर्तन, मानवीय हलचल और वनों पर पड़ते भारी जन-दबाव के फलस्वरूप लाइलाज बीमारियों और जीवन रक्षक औषधियों के निर्माण में आने वाली जड़ी-बूटियाँ बड़े पैमाने पर नष्ट हो रही हैं।

वर्तमान में महत्वपूर्ण जड़ी-बूटियाँ जैसे कूट, कटकी, हथाजड़ी, चिरायता, अतीस, वनककड़ी इत्यादि का फार्मास्युटिकल व कॉस्मेटिक कंपनियों में मांग बढ़ने लगी तो मनुष्य ने अवैध रूप से खनन करके इनको बेचना शुरू किया जिसका परिणाम आज कुछ जड़ी बूटियाँ विलुप्ति की कगार पर हैं तो कुछ संकट ग्रस्त तथा कुछ दुर्लभ व अतिदुर्लभ क्षेत्र में आ गई हैं।

अतः इन्हीं जड़ी-बूटियों के संरक्षण व कृषिकरण को बढ़ाने के लिये कई सरकारी एवं गैर-सरकारी संस्थान/विभाग सहित उच्च शिखरीय पादप कायिकी शोध केन्द्र (हैप्रेक) भी लम्बे समय से प्रयासरत है। उत्तराखण्ड के औषधीय और संगठित पादप संसाधनों के संरक्षण विकास और स्थायी उपयोग के लिए गोपेश्वर में १९८६ में उत्तराखण्ड औषधीय पादप बोर्ड की एक नोडल एजेंसी जड़ी-बूटी पौध एवं विकास संस्थान (एचआरडीआई) की स्थापना की गई है। एचआरडीआई का मुख्य उद्देश्य विभिन्न सरकारी एजेंसियों, किसानों, अनुसंधान संस्थानों, गैर-सरकारी संगठनों, आदि द्वारा संचालित औषधीय एवं संगठित पौधों की गतिविधियों का समन्वय करना है।

**हैप्रेक द्वारा बहुमूल्य जड़ी-बूटियों के संरक्षण एवं विकास हेतु किये जा रहे प्रयास**

हैप्रेक की स्थापना तात्कालिक निदेशक प्रो० ए०एन० पुरोहित द्वारा १९७९ म उच्च हिमालयी क्षेत्र में उगने वाली महत्वपूर्ण दुर्लभ प्रजातियों के शोध कार्यों व संरक्षण के लिये की गई। साथ ही दुर्लभ प्रजातियों के अध्ययन हेतु एल्पाइन शोध केन्द्र तुगनाथ (३६०० मी० ऊँ०) व पोथीबासा (२२०० मी०) में प्रदर्शन व शोध स्थल बनाये गये। वर्तमान में यहाँ पर हिमालय के विभिन्न क्षेत्रों में पाई जाने वाली दुर्लभ औषधीय प्रजातियों के बीज, उनके प्राकृतिक आवासों व फ़िल्ड स्टेशनों से एकत्रित कर वैज्ञानिक ढंग इनकी पौध तैयार की जाती है (चित्र ११)। तैयार की गई पौध के अग्र भाग जैसे पत्ती, जड़, प्रकन्द व कन्द से उत्तक संवर्धन द्वारा विस्तारीकरण के पश्चात कास्तकारों को निपुलक वितरित कर कृषिकरण में लाने का प्रयास किया जाता है। लगभग ३५ वर्षों के



चित्र ११: बहुमूल्य जड़ी-बूटियों के संरक्षण एवं विकास हेतु हैप्रेक द्वारा निर्मित प्रदर्शनी एवं संरक्षित केंद्र

प्रयासों से आज तुंगनाथ में ६० प्रजातियों व पोथीबासा में ३० प्रजातियों का संरक्षण किया जा रहा है (सारिणी २)। शोध कार्यों के साथ-साथ संस्थान द्वारा निम्न, मध्य व उच्च हिमालय के जड़ी-बूटी कास्तकारों को कृषिकरण की तकनीक व प्रशिक्षण के साथ विद्यालय स्तरीय जागरूकता परख कार्यक्रम संचालित किये जाते हैं। पादप जगत के क्षेत्र में जिन प्रजातियों को उगाने में कठिनाई पाई गई, संस्थान द्वारा उन प्रजातियों को उगाने के लिये श्रीनगर गढ़वाल में आधुनिक विज्ञान बायोटेक्नोलॉजी यूनिट की स्थापना करके उनका संवर्धन एवं विकास किया जाता है। गोविन्द बल्लभ पन्त राष्ट्रीय हिमालयी पर्यावरण संस्थान, अल्मोड़ा द्वारा वित्त पोषित नेशनल मिशन ओन हिमालयन स्टडीज (NMHS) परियोजना के अंतर्गत हैप्रेक द्वारा किये गये एक सर्वेक्षण के अनुसार वर्तमान में उत्तराखण्ड के हिमालयी क्षेत्र, कुमाऊँ और गढ़वाल के ६ जिले (उत्तरकाशी, रुद्रप्रयाग, चमोली, टिहरी, पिथौरागढ़ व बागेश्वर) तथा ८५ गाँव (उत्तरकाशी-८, टिहरी-८, रुद्रप्रयाग-८, चमोली-१७, पिथौरागढ़-३४, बागेश्वर-१०) सम्मिलित हैं। ये सभी गाँव २५०० से ३५०० मीटर की ऊँचाई के मध्य स्थित हैं जिनके अन्तर्गत लग. भग ४५१ नाली पर औषधीय एवं सगन्ध पादपों का कृषिकरण २२२ किसानों/कास्तकारों द्वारा किया जा रहा है। इनमें से सर्वाधिक १२४ नाली पर ग्राम-घेस, चमोली में ५६ किसानों द्वारा कुट, कुटकी, जटामासी आदि का कृषिकरण वृहद रूप में किया जा रहा है।

इसी उद्देश्य को रखते हुए संस्थान द्वारा निम्न पादपों, जिनका उपयोग पारम्परिक चिकित्सा पद्धति में पुरातन से हो रहा है, का चयन कृषिकरण हेतु किया गया है। जिनमें सोलह दुर्लभ, आठ संकटापन्न, तीन पराजेय तथा तीन अन्य औषधीय पादपों का विवरण इस प्रकार है-

## सारिणी २ कृषिकरण हेतु चयनित पादप प्रजातिया एवं उनका विवरण

क्र० सं०	वानस्पतिक नाम	सामान्य नाम	वर्तमान स्थिति	उपयोगी भाग	ऊँचाई मी०
1	पैरिस पोलिफायला	सतवा, दूधिया बच	दुर्लभ	प्रकन्द	2200-3200
2	पिकोराइजा कुरुआ	कुटकी	दुर्लभ	भूस्तारी तना/जड़ें	3000-4500
3	ऐंजेलिका ग्लौका	चोरु	दुर्लभ	जड़ें/प्रकन्द	2700-3400
4	डैक्टिलोराइजा हथाजीरिआ	हथाजड़ी	दुर्लभ	कन्दिल जड़ें	2500-3500
5	पोलिगोनम रुमिसिफोलियम	कन्थला	दुर्लभ	पत्तियों, तना और प्रकन्द	3500-4500
6	पोलिगोनेटम सिरिफोलियम	मेदा, महामेदा	दुर्लभ	शिफास्तम्भ	1500-3700
7	रेऊम इमोडी	आर्चा	दुर्लभ	जड़ें, तना, पत्तियों	2800-3600
8	रेऊम मूरक्राफ्टियानम	डोलू, रुबार्ब	दुर्लभ	प्रकन्द, जड़ तन्त्र, पत्तियों	3500-5000
9	इन्यूला रेशीमूसा	पुष्कर मूल	दुर्लभ	जड़ें, प्रकन्द	1500-4200

10	एलियम स्ट्रैचिआई	फरन	दुर्लभ	पत्तियों, फूल, बीज, कन्द	3000-4000
11	वैलिरियाना जटामासी	टगर	दुर्लभ	जड़ें, प्रकन्द	1200-1800
12	हैरीकैलियम कैन्डीकैन्स	पतराला	दुर्लभ	पत्तियों	
13	सैलियम वैगेनितम	भूतकेषी	दुर्लभ	फल, प्रकन्द	3180
14	हिप्पोफ्री	अमेस	दुर्लभ	फल, बीज	2000-3200
15	ब्रजनिया स्टार्काई	सिलफारी	दुर्लभ	जड़	3300-4500
16	हैबनैरिया इण्टरमीडिया	रिद्धि वृद्धि	दुर्लभ	जड़	2800-3200
17	पोडोफायलम हेक्जेण्ड्रम	वनककड़ी	संकटापन्न	प्रकन्द/फल	2700-3600
18	जुरिनिया डोलोमिआका	गुग्गल धूप	संकटापन्न	प्रकन्द	3400-5000
19	सास्सूरिया कोस्टस	कूट, कोस्टस	संकटापन्न	प्रकन्द, जड़	2500-3000
20	पियोनिया इमोडी	चन्द्रा	संकटापन्न	जड़	2000-3000
21	क्रिटिलिरिया रॉयली	काकोली	संकटापन्न	जड़, प्रकन्द	3000-4000
22	एरनीबिया बैनथामी	लालजड़ी	संकटापन्न	जड़	3000-4000
23	एकोनाइटम बाल्फराई	मीठा विष	संकटापन्न	कन्द	2800-4200
24	एकोनाइटम हेटेरोफायलम	अतीस	संकटापन्न	कन्द	3000-4200
25	मेगाकार्पिया पोलिपेण्ड्रा	रुकी	पराजेय	जड़ें/प्रकन्द	2800-3500
26	आर्नेबिया बेन्थेमाई	रतनजोत	पराजेय	समूचा पौधा/जड़	3000-4000
27	स्वेर्सिया विरायिता	चिरायता	पराजेय	संपूर्ण पौधा, बीज	1800-2500
28	हेडिचियम स्पायकेटम	कपूरकचरी	पराजेय	प्रकन्द	1500-2200
29	कैरम कर्वी	काला जीरा	संकटापन्न	बीज/जड़ें	1800-2500
30	नाडोस्टैकिस जटामासी	जटामासी	दुर्लभ	जड़ें/प्रकन्द	3200-5000





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#### संदर्भ

नौटियाल बी०पी० एवं नौटियाल एम०सी० (२००४)। एगरोटेकनिक्स फहर हाई अल्टिट्यूड मेडिसिनल एण्ड एरोमेटिक प्लांट्स। हाई अल्टिट्यूड प्लांट फिजि. ओलोजी रिसर्च सेंटर श्रीनगर गढ़वाल उत्तराखण्ड।

गोपाल एन०एम०, तेजस्विनी जे०, मेंत्री एस० एवं कुमार एस०ए० (२०१४)। इन्टरनेशनल स्टैंडर्ड्स अहफ मेडिसिनल प्लांट्स। आई०जे०आई०पी०एस०आर०, २(१०)।

प्रदीप डोभाल, प्रवीन जोषी एवं विजय कान्त पुरोहित  
उच्च शिखरीय पादप कार्यिकी शोध केंद्र, हे०न०ब० गढ़वाल विश्वविद्यालय,  
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## संयोजक संस्थान

गोविन्द बल्लभ पंत राष्ट्रीय हिमालयी पर्यावरण संस्थान की स्थापना सन् 1988-89 में पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय भारत सरकार के स्वायत्तशासी संस्थान के रूप में की गयी। यह संस्थान सम्पूर्ण भारतीय हिमालयी क्षेत्र में वैज्ञानिक ज्ञान को बढ़ावा देने एकीकृत प्रबंधन रणनीति बनाने व उनके प्राकृतिक संसाधनों के संरक्षण में प्रभाविता के प्रदर्शन और पर्यावरण दृष्टि से मजबूत प्रबंधन हेतु मुख्य संस्थान के रूप में चिन्हित है।

## Coordinating Institute

G.B. Pant National Institute of Himalayan Environment was established in 1988-89 as an Autonomous Institute of the Ministry of Environment Forest & Climate Change (MoEF&CC), Government of India. The Institute has been identified as focal agency to advance scientific knowledge, evolve integrated management strategies, demonstrate their efficacy or conservation of natural resources, and ensure environmentally sound management in the entire Indian Himalayan Region (IHR).



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