



VISION

To be a global leader on technologies for boosting bioeconomy through sustainable utilization of Himalayan bioresources

MISSION

To discover, innovate, develop and disseminate the processes, products and technologies from Himalayan bioresources for society, industry, environment and academia

BIORESOURCE

- ◆ Plants
- ◆ Algae
- ◆ Fungi
- ◆ Bacteria
- ◆ Viruses
- ◆ Insects
- ◆ Animals

TECHNOLOGY

- ◆ Agrotechnology
- ◆ Biotechnology
- ◆ Chemical Technology
- ◆ Dietetics & Nutrition Technology
- ◆ Environmental Technology
- ◆ Fermentation & Phytofarming Technology

BIOECONOMY

- ◆ Industrial Crops
- ◆ Floriculture, Horticulture, Medicinal & Aromatic Crops
- ◆ Food & Nutraceuticals
- ◆ Industrial Enzymes
- ◆ Biowaste Management
- ◆ Technology Dissemination & Capacity Building

RESEARCH ACTIVITIES

- ♦ Conservation, multiplication and sustainable utilization of bioresources
- ♦ Multispectral, hyperspectral, LiDAR and drone-based conventional and modern remote sensing
- ♦ Creating knowledgebase (floristic databases, herbarium and traditional knowledge)
- ♦ Ecological niche modelling
- ♦ Long Term Ecological Research (LTER) sites for climate change and phenology
- ♦ Diversity Analysis: Biological, molecular and chemical
- ♦ Understanding plant functions, adaptive strategies, genomics, transcriptomics, metabolomics and regulomics
- ♦ AI/ML Driven Bioinformatics, computational biology
- ♦ Micropropagation protocols for high value crops
- ♦ Marker assisted breeding
- ♦ Plant microbe interaction
- ♦ Functional foods & Nutraceuticals
- ♦ Value added food products
- ♦ Waste management
- ♦ Standards for quality evaluation of Medicinal and Aromatic Plants (MAPs)
- ♦ Chemical fingerprinting and DNA bar-coding for authentication of plants
- ♦ Scalable platforms for production of bioactives and therapeutics
- ♦ Green and sustainable chemistry
- ♦ Natural product chemistry
- ♦ Scale-up of processes for herbals and industrial chemicals
- ♦ Nanobiology
- ♦ Natural fibers



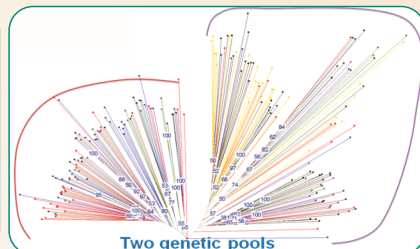
Long Term Ecological Research Sites



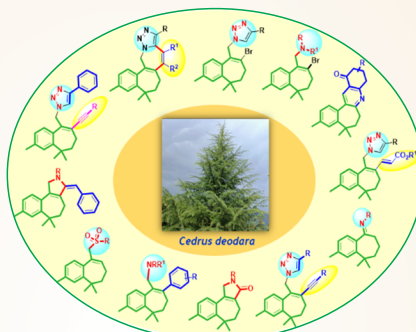
Drone and Hyperspectral Remote Sensing



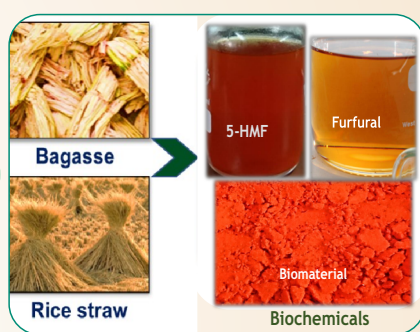
Virus free Apple rootstocks



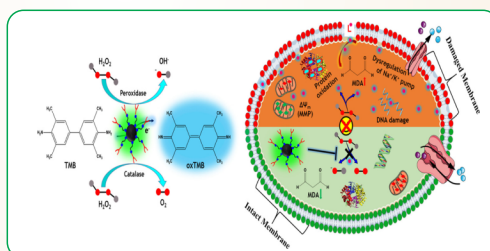
Molecular Diversity in Medicinal Plants



Nature derived bio-active molecules



Biomass conversion to furanic compounds



Nanozymes for healthcare applications



Phytofactory



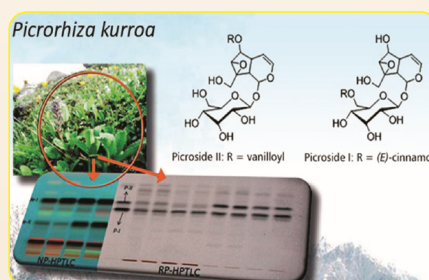
Biodegradable bioplastic from High altitude bacteria



Value added products from Microalgae



Textile fiber from Plant resources



Natural product: Quality control



DNA barcodes for authentication of plants

AGROTECHNOLOGIES FOR ENHANCING FARMERS' INCOME

Industrial Crops

- ♦ Introduction of high value crops: Blueberry, Dragon fruit and Avocado for cultivation in hills
- ♦ Asafoetida (*Heeng*): Indigenous seed production in India and establishment of seed production centers
- ♦ Stevia: Planting materials for large-scale cultivation, technical advice, support for processing of steviol glycosides
- ♦ Apple: Successful cultivation of low-chilling varieties in North-East India
- ♦ Tea: Rejuvenation of tea gardens and mechanization
- ♦ Monk fruit: Successful cultivation in India and area extension
- ♦ Saffron: Cultivation in non-traditional areas and area extension
- ♦ Cinnamon (*Dalchini*): Successful cultivation in North India



Introduction of high-value crops (Avocado, Dragon fruit and Peony)



Indigenous seed production of Heeng in India

Cultivation of Monk Fruit in India

Saffron Cultivation in Non-traditional Area



Cultivation of Tulip, Liliium, Calla lily and Marigold

Aromatic Crops

- ♦ Damask Rose, Rosemary, Wild Marigold, Lavender, German Chamomile, Clary Sage and Indian Valerian cultivation technologies
- ♦ Cultivation of aromatic crops in waste/ unproductive/ unutilized land
- ♦ Central & mobile facilities for distillation of essential oils for clusters of farmers

Medicinal Plants- Conservation & Resource Generation

- ♦ Conservation & rehabilitation of threatened medicinal species
- ♦ In-situ and ex-situ conservation: *Inula racemosa*, *Sinopodophyllum*, *Picrorhiza*, *Aconitum*, *Dactylorhiza* and *Nardostachys*
- ♦ Nurseries for generating quality planting material: species of *Fritillaria*, *Trillium*, *Valeriana*, *Curcuma*, *Hippophae*, *Tinospora* and *Ginkgo*

Support

- ♦ Captive cultivation of medicinal plants
- ♦ Quality planting material
- ♦ Standardized agro-technologies



On site distillation of essential oil



Mechanical harvesting of tea



High tech Bamboo nursery



Improved beehive

Floriculture

- ♦ Ornamental bulb production technology
- ♦ Gerbera, Chrysanthemum, Carnation, Peony, Gladiolus, Tuberose, Tulip, Liliium, Calla lily, Rose, Alstroemria, Orchids and Marigold cultivation technologies
- ♦ New cultivars of Gerbera, Chrysanthemum, Calla lily and Liliium
- ♦ Commercial Floriculture in non-traditional areas
- ♦ Refrigerated van facility for marketing of flowers
- ♦ Orchids: protective cultivation



Damask Rose



Wild Marigold



Lavender

- ♦ Field demonstrations
- ♦ Extension and advisory
- ♦ Specialized training programmes

Bioprospecting Bamboo

- ♦ Resource generation: Bulk supply of quality planting material
- ♦ Value-added products: Candies, noodles, nuggets, bamboo charcoal, cellulose & lignin
- ♦ High tech bamboo nursery

Apiculture

- ♦ Improved beehive for quality & hygienic extraction of honey

TECHNOLOGIES FOR INDUSTRIAL ENTERPRISE

Food & Nutraceuticals

- ◆ Gluten-free products
- ◆ Multi-grain based protein & fiber-enriched food products
- ◆ Micronutrient (calcium, zinc & iron) fortified food products
- ◆ Value added food products: Dehydrated fruits and vegetables, Crispy fruits, Energy bars and Honey based products
- ◆ Chemical & preservative free canning technology: Ready to eat food products (Kangri Dham)
- ◆ Tea products (Green, Black & Herbal teas, Ready to drink teas)
- ◆ Himalayan Yeast based curd
- ◆ Catechins & Theaflavins
- ◆ Alternative sweeteners: Steviol glycosides and Mogrosides
- ◆ Vitamin D₂ -enriched Shiitake (*Lentinula edodes*)
- ◆ Formulation for immunity modulation
- ◆ Formulation to promote cartilage health
- ◆ Formulation to promote cognitive health



Stevia Sweetener



Saffron



Compost Booster



Natural colours from Himalayan bioresources

CAPACITY BUILDING AND TRAINING

Incubation Facilities

- ◆ Food processing
- ◆ Herbal processing pilot plant
- ◆ Essential oil distillation units
- ◆ Tissue culture
- ◆ Automated green house
- ◆ Hydroponics and Aeroponics
- ◆ Medicinal and aromatic plants
- ◆ Virology

Skill Development Programmes

- ◆ Hands-on-laboratory experiments & analytic exposure
- ◆ Plant tissue culture, gardener/floriculturist and protected cultivation
- ◆ Quality control biologist
- ◆ Lab technician/assistant (LSSDC approved)
- ◆ Laboratory practices in animal house
- ◆ Women and youth empowerment

Popularizing Science: Exhibitions and Trainings

- ◆ School students: exposure to different science labs and hands-on-training
- ◆ Orientation programs for school teachers
- ◆ Research internships/dissertation programmes for under graduate/ post-graduate students
- ◆ Outreach activities for school students and their teachers under JIGYASA programme
- ◆ Participation in international and national trade fairs/exhibitions



Fortified food Products to combat malnutrition



Ready to Eat Food



Tea Catechins



Vitamin D₂-enriched Shiitake Mushroom



Medhakra Syrup (Nutraceuticals to Promote Cognitive health)



Nutraceuticals to Promote Cardiac health



Industrial products

- ◆ Biopolymers & Biodegradable bioplastic
- ◆ Compost booster for cold region
- ◆ Essential oils & Perfumes
- ◆ Value added Herbal products: Incense cones, Hair oil & Soaps
- ◆ Natural Colors
- ◆ Biomass conversion to furanic compounds
- ◆ Certified reference materials (RCM)

Industrial Enzymes

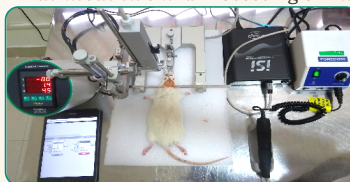
- ◆ Asparaginase
- ◆ Polyphenol oxidase



Pilot Plant for Developing Functional Food Nutraceuticals and Processing of Natural Products



Spray Dryer for Herbal Processing



Laboratory Animal Experimentation



Plant Tissue Culture Facility



Incubatees at CSIR-IHBT



Trainings on Apiculture



Orientations and Hands-on Trainings to Students from School and Colleges

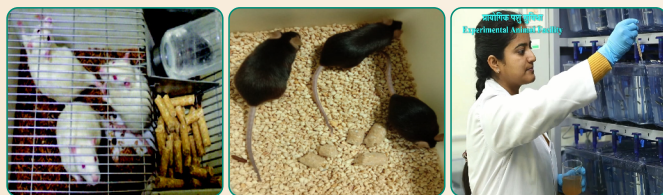


RESEARCH INFRASTRUCTURE

- ◆ Proteomic facility with MALDI-ToF, MALDI ToF-ToF and Ion Mobility Q-ToF LC/MS
- ◆ Analytical and Metabolomics facility: HPLC, GC with headspace, GC-MS, UPLC MS-MS, NMR-400 MHz and Single Crystal X-ray diffraction (SC-XRD)
- ◆ Super critical extraction facility
- ◆ High-end chemical research facility
- ◆ Bioinformatics facility (high end workstations, servers, Linux cluster for parallel computing algorithms, distributed computing)
- ◆ High resolution microscopy: Scanning electron, transmission electron, atomic force, confocal, laser assisted dissection, stereozoom with micromanipulator
- ◆ Hydroponic, aeroponic and vertical aeroponic facilities
- ◆ cGMP Protein Facility
- ◆ Large scale tissue culture facility for heeng and saffron
- ◆ Facilities for virus indexing, heavy metal toxicity testing and pesticide residue analysis
- ◆ Food processing and analytical facility
- ◆ Phytofactory Facility
- ◆ Herbarium, arboretum & fernery
- ◆ Commercial plant tissue culture facility
- ◆ Walk-in plant growth chambers
- ◆ State-of-the-art geoinformatics facility
- ◆ Plant identification, soil testing, mapping (RS-GIS platform)
- ◆ Biochars and compost booster production unit
- ◆ Farms and polyhouses for domestication and development of agrotechnologies of ornamentals, aromatic and medicinal plants and high value crops



Aeroponic, Hydroponic and Vertical Aeroponic Facilities



Rats

Mice Preclinical Research Facility

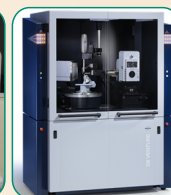
Zebra Fish Facility



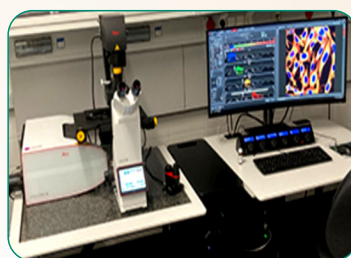
Proteomics: MALDI ToF/ToF



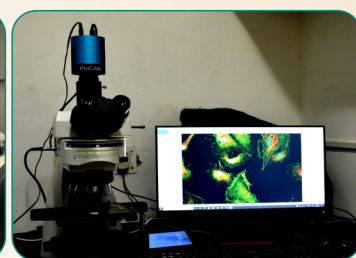
Transmission Electron Microscope



LCMS, NMR-400 MHz and Single Crystal-XRD System



Confocal Microscope



Fluorescent Microscope



Phytofactory Facility



Industrial Scale Enzyme Bioprocessing Facility



Ornamental Bulb Processing Facility



Commercial Plant Tissue Culture Facility



Internationally Recognized Herbarium

SERVICES

- ◆ Analytic services: Qualitative and quantitative analysis, chemical profiling and standardization of materials/products
- ◆ NexGen sequencing: Library preparation and sequencing of genome and transcriptome
- ◆ Preclinical testing services, hematological and histopathological analysis, cytotoxicity studies on different human cancer cell lines
- ◆ The institute is authorized for "Post entry quarantine (PEQ)" inspection for import of in vitro TC materials vide Gazette of India notification
- ◆ Plant viral indexing
- ◆ Animal testing - Mice, Rats, Zebra Fish
- ◆ Remote sensing and GIS
- ◆ Soil, plants and nano-material analyses

Centre for High Altitude Biology (CeHAB)

Ribling, District Lahaul and Spiti, Himachal Pradesh (Established 2011)



Centre for High Altitude Biology (CeHAB) of the institute is situated in the trans-Himalayan region at an elevation of 3450 m amsl. The major infrastructure setup of the centre include tissue culture facility, chemistry lab, food processing units, essential oil distillation facility,

research farm, and a plant conservatory. Apart from the research undertaken in the centre around studying bio-systems at high altitudes *vis-à-vis* climate change; ecology and plant adaptation, bioprospecting bioresources, and *ex situ* conservation, the centre has a strong mandate to empower tribal communities of high altitude for inclusive growth.

Conservatory of High Altitude Plants at CeHAB



Hippophae rhamnoides



Dactylorhiza hatagirea



Fritillaria cirrhosa



Sinopodophyllum hexandrum

SUPPORT FACILITIES

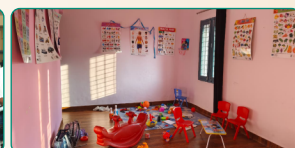
- ◆ House of Bamboo
- ◆ Gymnasium Facility
- ◆ Creche Facility
- ◆ ICT- internally hosted web, E-mail and DNS servers linked under NKN with gigabyte and 24x7 Wi-Fi connectivity
- ◆ Training block with virtual classroom
- ◆ Library
- ◆ Auditorium & conference halls
- ◆ Guest house & Sabbatical home
- ◆ Hostel for research scholars
- ◆ Dispensary
- ◆ AcSIR-IHBT



House of Bamboo



Gymnasium Facility



Creche Facility



Library and Auditorium



Sabbatical Home



Guest House



Hostel for Research Scholars



Dispensary

Academic, R&D and Technology Collaborations



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Instagram: https://www.instagram.com/csir_ihbt/, **Linkedin:** <https://www.linkedin.com/in/csir-institute-of-himalayan-bioresource-technology-197767261/>, **YouTube:** <https://www.youtube.com/@CSIR-IHBT>