



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 technologies and knowledge from Himalayan bioresources for society, industry, environment and academia

BIORESOURCE

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

TECHNOLOGY

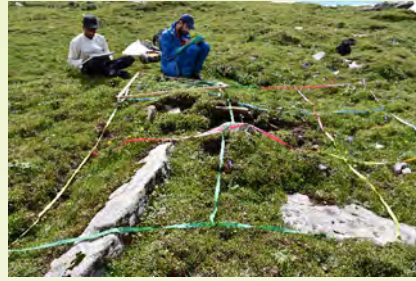
- Agrotechnology
- Biotechnology
- Chemical Technology
- Dietetics & Nutrition Technology
- Environmental Technology

BIOECONOMY

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

RESEARCH ACTIVITIES

- Diversity Analysis: Biological, molecular, chemical
- Multispectral, hyperspectral, LiDAR and drone-based remote sensing
- Conservation, multiplication & utilization
- Creating knowledgebase-databases, repository (herbarium)
- Climate change studies: Free Air CO₂ Enrichment (FACE) & Free Air Temperature Increase (FATI) facility, Simulation modeling, Long Term Ecological Research (LTER) sites
- Understanding plant functions, adaptive strategies and mechanisms
- Regulatory pathways, gene functions, enzymes
- Metabolic engineering and synthetic biology
- Multi-omic studies: genomics, transcriptomics, proteomics, metabolomics
- Bioinformatics, computational- and systems biology
- Nanobiology
- Chemical fingerprinting and DNA bar-coding for authentication of plants
- Green and sustainable chemistry
- Natural product chemistry
- Bacteria, fungi and algae prospection
- Biomass to furanic compounds
- Natural fibers
- Plant virus vector interaction



Plant Diversity Assessment



Long Term Ecological Research Sites



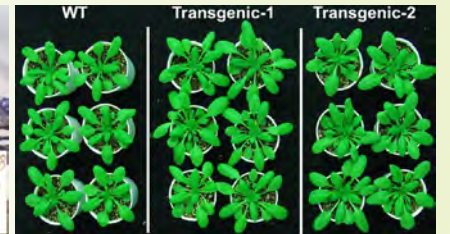
FACE & FATI Facility



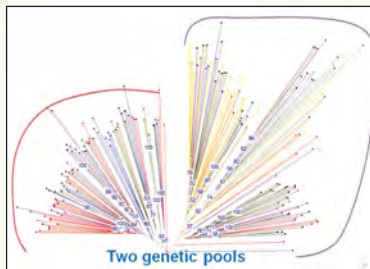
Hyperspectral Imaging Sensors



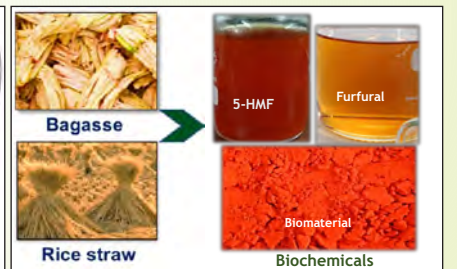
Discovered and Engineered a Novel Superoxide Dismutase



Discovered a Novel Pathway: Introduction Improved Yield by Reassimilating Photorespired CO₂ and NH₃ in Arabidopsis



Molecular Diversity in Medicinal Plants



Biomass conversion to furanic compounds



Biodegradable Bioplastic from High Altitude Bacteria



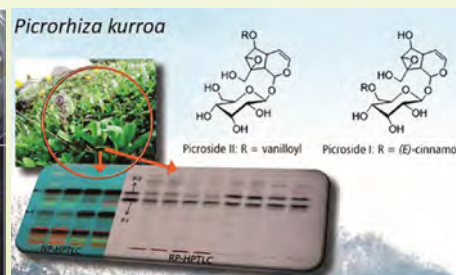
Value Added Products from *Spirulina platensis*



Vitamin D₂-enriched Shiitake Mushroom



Textile Fiber from Plant Resources



Natural Product: Quality Control



DNA Barcodes for Authentication of Plants

AGROTECHNOLOGIES FOR ENHANCING FARMERS' INCOME

Support

- Quality planting material
- Standardized agro-technologies
- Processing technologies
- Field demonstrations (plantation, processing of produce)
- Extension & advisory by creating farmer groups
- Specialized training programmes

Industrial Crops

- Tea: rejuvenation of tea gardens, mechanization, value addition & diversified products
- Stevia: planting materials for large-scale cultivation, technical advice, support for processing of steviol glycosides
- Asafoetida (*Heeng*): introduction in India and establishment of seed production centers
- Monk fruit: introduction in India & area extension
- Saffron: cultivation in non-traditional areas & area extension
- Cinnamon (*Dalchini*): introduction in north India
- Apple: introduction in north-east India
- Orchids: protective cultivation

Mountain Floriculture

- Cut Flowers: Alstroemeria, carnation, gladiolus, rose, gerbera, chrysanthemum, calla lily, tulip
- New cultivars of gerbera, gladiolus, liliium
- Commercial floriculture in non-traditional areas

Aromatic Crops

- Damask rose, rosemary, wild marigold, lavender, mushkbala, *Hedychium spicatum*
- Standards for quality evaluation of essential oils
- 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: *Sinopodophyllum*, *Picrorhiza*, *Aconitum*, *Dactylorhiza*, *Nardostachys*
- Nurseries for generating quality planting material: species of *Fritillaria*, *Trillium*, *Valeriana*, *Curcuma*, *Hippophae*, *Tinospora*, *Ginkgo*
- Captive cultivation of medicinal plants

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

Sericulture

- Improved methods of raising silkworm caterpillars (larvae)

Pearl Culture

- Pearl culture in different aquatic systems for quality production



Introduction of Asafoetida (*Heeng*) in India



Introduction of Monk Fruit in India



Saffron Cultivation in Non-traditional Area



Introduction of Liliium, Calla lily and Tulip in Himachal Pradesh



Introduction of Cinnamon (*Dalchini*) in North India



Introduction of Apple in North-East India



Damask Rose



Wild Marigold



Lavender



On site Distillation of Essential Oil



Mechanical Harvesting of Tea



High Tech Bamboo Nursery



Bamboo Kiln



Pearl Culture in Hydroponics & Low-Cost Tanks



Improved Beehive (In Collaboration with CSIR-CSIO)

TECHNOLOGIES FOR INDUSTRIAL ENTERPRISE

Food & Nutraceuticals/Pharmaceuticals

- Gluten-free products
- Calcium, zinc & iron fortified products
- Multi-grain based protein & fiber-enriched Food products
- Crispy fruits, dietary fiber
- Chemical & preservative free canning technology (ready to eat)
- Tea products (green-, black- & herbal teas, tea-wine, ready to drink teas)
- Himalayan yeast based curd
- Herbal formulation for immunity modulation
- Catechins & theaflavins
- Steviol glycosides
- Aecin
- Saffron
- Vitamin D₂-enriched Shiitake (*Lentinula edodes*)
- Honey based products
- Formulation for immunity modulation
- Formulation to promote cartilage health

Industrial products

- Biopolymers
- Biodegradable bioplastic from high altitude bacteria
- Compost booster for cold region
- Essential oil
- Herbal incense cones
- Herbal hair oil

Industrial Enzymes

- Asparaginase
- Polyphenol oxidase
- Superoxide dismutase

CAPACITY BUILDING AND TRAININGS

Incubation Facilities

- Food and fruit processing
- Low calorie sweeteners
- Value added tea products
- Tissue culture
- Floriculture
- Apiculture
- Medicinal and aromatic plants
(*Recognized by DSIR under CRTDH scheme, MSME and HP State Industry Department)
- Virology

Skill Development Programmes

- Hands-on-laboratory experiments & analytic exposure
- Plant tissue culture, gardener/floriculturist, protected cultivation, meristem tip culture for freedom from viruses
- Quality control biologist
- Lab technician/assistant (LSSSDC 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



Multigrain Fruit and Nut Nutri Bar

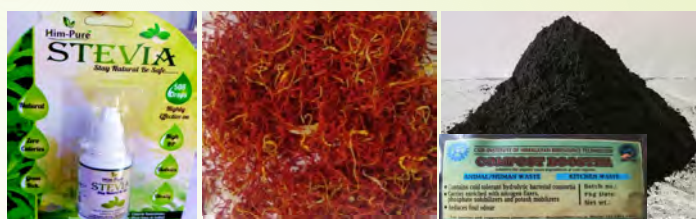
Value added food products



Ready to Eat Food

Herbal Formulation

Tea Catechins



Stevia Sweetener

Saffron

Compost Booster



Pilot Plant for Developing Functional Food and Nutraceuticals

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

- Next-generation sequencing system PacBio RSII and NovaSeq 6000
- Proteomic facility with MALDI-ToF, MALDI ToF-ToF and Ion Mobility Q-ToF LC/MS
- Metabolomic facility: HPLC, GC with headspace, GC-MS, UPLC MS-MS, NMR-300, 600 Mhz, super critical extraction 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 (34000 flasks capacity)
- Facilities for virus indexing, heavy metal toxicity testing and pesticide residue analysis
- Food processing and analytic facilities (encapsulation, extruder, flaking and freeze drying units, cereal puffer, carbohydrate analyzer and capillary electrophoresis)
- Tissue and cell culture facilities (micro-propagation culture lab, secondary metabolites production in bioreactors, transgenic production, and containment)
- Walk-in plant growth chambers
- State-of-the-art geoinformatics facility
- Plant identification, soil testing, mapping (RS-GIS platform)
- Farms and polyhouses for domestication and development of agrotechnologies of ornamentals, aromatic and medicinal plants and high value crops

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 (toxicity studies in zebra fish, oral and dermal toxicity evaluation in mice and rats), 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
- COVID19 testing facility



Genomics & Transcriptomics: PacBio RSII and NovaSeq 6000



Metabolomics: NMR 600 MHz and Ion Mobility Q-ToF LC/MS



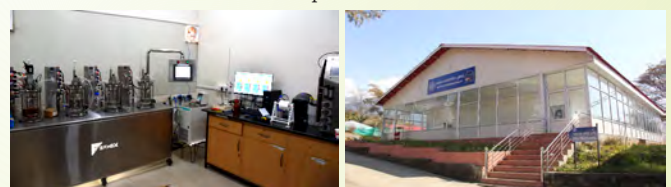
Proteomics: MALDI ToF/ToF

Transmission Electron Microscope



Confocal Microscope

Fluorescent Microscope



Lab Scale Enzyme Bioprocessing Facility



Industrial Scale Enzyme Bioprocessing Facility



Aeroponic, Hydroponic and Vertical Aeroponic Facilities

Bioreactor



Rats

Mice

Zebra Fish

Preclinical Research Facility

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 functional 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

- Herbarium, arboretum & fernery
- House of Bamboo
- ICT- internally hosted web, E-mail and DNS servers linked under NKN with gigabyte and 24x7 Wi-Fi connectivity
- Studio-cameras for still- and video photography, systems for sound recording, processing and making short documentaries
- Training block with virtual classroom
- Commercial plant tissue culture facility
- Library- books, databases, access to >2000 online journals
- Auditorium & conference halls
- Sabbatical home
- Guest house
- Hostel for research scholars
- Dispensary
- AcSIR-IHBT



Internationally Recognized Herbarium



House of Bamboo



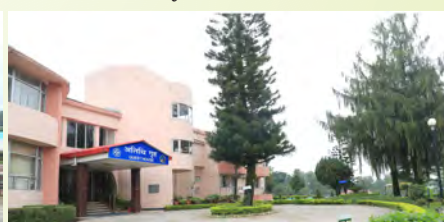
Commercial Plant Tissue Culture Facility



Library and Auditorium



Sabbatical Home



Guest House



Hostel for Research Scholars



Dispensary

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