CSIR-INSTITUTE OF HIMALAYAN BIORESOURCE TECHNOLOGY
PALAMPUR (HIMACHAL PRADESH)- 176061, INDIA

CSIR-IHBT
Established 1983

Ultimate Destination for Research and Technologies on Himalayan Bioresources

Himalayan Opportunities

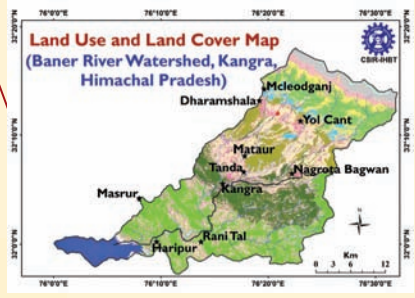
Industrial Crops
Aromatic Plants
Medicinal Plants
Floriculture
Nutraceuticals
Bacteria
Fungi
Algae
Diversified Products

VISION

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

MISSION

To discover, develop and commercialize processes and products from Himalayan bioresources using cutting-edge science and technology



STRATEGIC RESEARCH

- Diversity analysis
- Natural product and sustainable chemistry
- Genomics, transcriptomics, proteomics, metabolomics
- Nanobiology, bioinformatics

SOCIETY

- Livelihood options: Commercial crops and nurseries
- Quality planting material
- Advisory, training and skill development

INDUSTRY

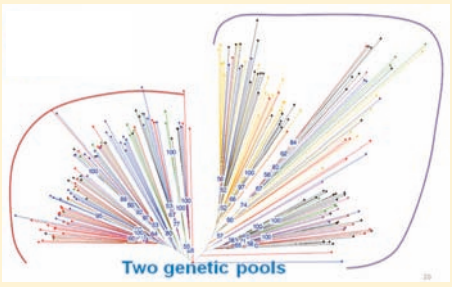
- Processing technologies
- Product development
- Incubation
- Entrepreneurship development and capacity building

RESEARCH STRATEGIES

Himalayan Bioresources

- Diversity analysis (biological, molecular, chemical)
- Mapping– multispectral, hyperspectral, LiDAR and drone-based remote sensing
- Conservation, multiplication and utilization
- Creating knowledgebase– databases, repository (International Herbarium-international acronym PLP)
- Climate change studies– Free Air CO_2 Enrichment [FACE], Free Air Temperature increase [FATI]: Simulation modeling, Long-term Ecological Research Plots
- Understanding plant functions, adaptive mechanisms
- Regulatory pathways, gene functions, enzymes
- Metabolic engineering and synthetic biology
- Omic studies (genomics, transcriptomics, proteomics, metabolomics)
- Chemical fingerprinting and DNA bar-coding for authentication of plants
- Green and sustainable chemistry
- Natural product chemistry
- Fungi prospection
- Algae prospection
- Biofuels and biopolymers
- Nanobiology
- Bioinformatics

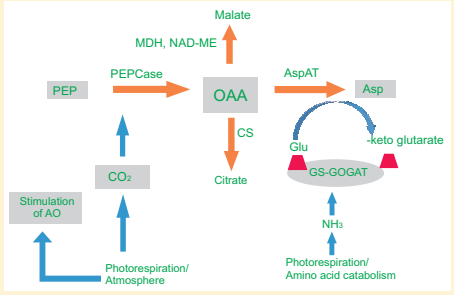
Plant Diversity Assessment



Molecular Diversity in *Podophyllum hexandrum*

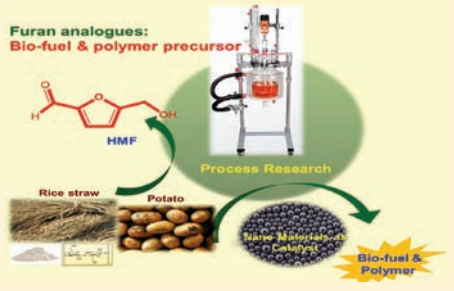
Hyperspectral Imaging Sensors

FACE and FATI Facilities

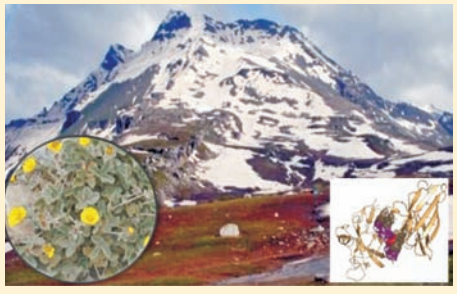


Novel CO_2 Fixation Mechanism in High Altitude Environment

Long-term Ecological Research Plots



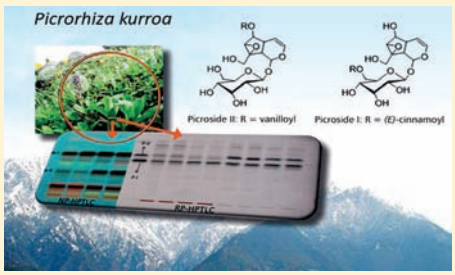
Green and Sustainable Chemistry



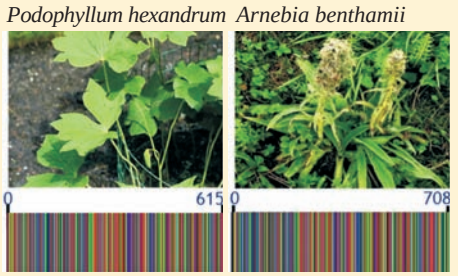
Novel Superoxide Dismutase

Spirulina platensis

Cultivation of *Lentinula edodes*



Natural Product: Quality Control



DNA Barcodes for Authentication of Medicinal Plants

AGROTECHNOLOGIES FOR ENHANCING FARMERS' INCOME

Support

- Quality planting material
- Standardized agro-technologies
- Processing technologies
- Field demonstrations (plantation, processing of produce)
- Extension and Advisory through creating farmers' groups & networking
- Specialized training programmes
- Essential oil distillation facility and mobile distillation unit

Industrial Crops

- Tea (rejuvenation of tea gardens, mechanization, value addition & diversified products)
- Stevia (planting materials for large-scale cultivation, technical advice, support for processing steviol glycosides)
- Saffron & Ginseng (cultivation in non-traditional areas, area extension through niche modeling)
- Orchids (protective cultivation)
- Monk fruit

Aromatic Crops

- Damask rose, rosemary, wild marigold, mushkbala *Hedychium spicatum*
- Standards for quality evaluation of essential oils
- Cultivation of aromatic crops in waste/ unproductive/unutilized land
- Central distillation facility for clusters of farmers

Medicinal Plants- Conservation and Resource Generation

- Conservation and rehabilitation of rare, endangered and threatened (RET) medicinal species
- *In-situ* and *ex-situ* conservation (Species of *Sinopodophyllum*, *Picrorhiza*, *Aconitum*, *Dactylorhiza*)
- Nurseries for generating quality planting material (Species of *Fritillaria*, *Trillium*, *Valeriana*, *Curcuma*, *Hippophae*, *Tinospora* and *Ginkgo biloba*)
- Captive cultivation of medicinal plants

Mountain Floriculture

- Cut flowers (alstroemeria, carnation, gladiolus, rose, gerbera)
- Commercial floriculture in non-traditional areas to enhance income by 4-5 times
- New cultivars of gerbera, gladiolus, lilium

Bioprospecting Bamboo

- Resource generation (bulk supply of quality planting material)
- Value-added edible products (candies, noodles, nuggets)
- Bamboo based products for cosmetic and industrial use (bamboo charcoal, cellulose, lignin)

Onsite Distillation of Essential Oil

Mobile Distillation Unit

Mechanical Harvesting of Tea

Saffron: Niche Modeling

Damask Rose

Wild Marigold

***Valeriana* sp.**

Rehabilitating RET Plants

Lilium

Cala Lilly

Bamboo Kiln and Charcoal

TECHNOLOGIES FOR INDUSTRIAL ENTERPRISE

Food & Nutraceuticals

- Gluten-free products
- Calcium & iron fortified products
- Crispy fruits, dietary fiber
- Chemical and preservative free canning technology (ready to eat)
- Tea products (green- black- & herbal teas and tea-wine)

Biomolecules

- Steviol glycosides
- Aecin
- Catechins & theaflavins
- Biopolymers

Industrial Enzymes

- Superoxide dismutase
- Asparaginase
- Polyphenol oxidase

Incubation Facility*

- Food processing
- Fruit processing
- Low calorie sweeteners
- Value addition to tea
- Tissue culture
- Floriculture
- Medicinal and Aromatic Plants

(*Recognized by DSIR under CRTDH scheme, MSME and HP State Industry Department)

SKILL DEVELOPMENT PROGRAMMES

- Diploma in Laboratory Practices in Animal House
- Diploma in Hands-on-Laboratory Experiment and Analytic Exposure
- Certificate courses: Plant Tissue Culture, Laboratory Animal Breeding & Housing Practices, Gardening/ Floriculture
- Women and youth empowerment

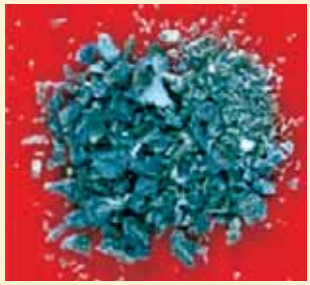
POPULARISING SCIENCE EXHIBITIONS AND TRAININGS

- School students: exposure to different science labs and hands-on-training
- School teachers orientation programme
- Summer/winter training for graduates/ post-graduate students

Gluten-free Nutri Bar

Crispy Apple

Ready to Eat
Kangri Dham



Superoxide Dismutase

Tea Catechins

Stevia Sweetener

Incubatees Working at CSIR-IHBT

Pilot Plant for Developing Functional Food and Nutraceuticals

Spray Dryer for Herbal Processing

Laboratory Animal Research

Tissue Culture Facility

Students Visit to Labs

Hands-on Training

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: HPLCs, GC with headspace, GC-MS, UPLC MS-MS, NMR-300, 600 Mhz, super critical extraction
- Bioinformatics facility (high end workstations, servers, Linux cluster for parallel computing algorithms, distributed computing)
- Microscopes (Scanning Electron, Transmission Electron, Atomic Force and Confocal, Laser Assisted Dissecting, Hi-end Stereozoom with Micromanipulator)
- Walk-in plant growth chambers
- Plant identification, soil testing, mapping (RS-GIS platform)
- Aeroponic and hydroponic facilities
- State-of-the-art geoinformatics facility
- 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 biorectors, transgenic production, and containment)
- 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), PacBio library preparation and sequencing. Soil, plants and nano-material analyses
- Regulatory services (toxicity study: zebra fish, oral and dermal toxicity evaluation in mice and rats), hematological and histopathological analysis, cytotoxicity studies on different human cancer cell lines
- Others (acute anti-convulsant activity- PTZ model, animals- mice, rats for testing)
- Remote sensing & GIS

PacBio RSII and MALDI ToF-MS/MS Facilities

NMR 600 MHz and Transmission Electron Microscope Facilities

Ion Mobility Q-ToF LC/MS

Hydroponic and Aeroponic Facilities

Bioreactor

Regulatory Research Facility

CeHAB - CENTRE FOR HIGH ALTITUDE BIOLOGY
RIBLING (LAHAUL & SPITI) HIMACHAL PRADESH (Established 2011)

CeHAB Laboratory Complex

Aligning with the National Mission for Sustaining Himalayan Ecosystems, a state-of-the-art centre has been established to undertake studies on adaptation biology of plants, microbes, insects and ecosystems in the wake of climate change and sustainable utilization of high altitude plant resources for the benefit of native people, society, industry and environment.

Cultivation of Crops at High Altitude

SUPPORT FACILITIES

- Herbarium, Arboretum & Fernery
- 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
- Guest House
- Bamboo Museum
- Hostel for Research Scholars
- Sabbatical Home
- Auditorium & Conference Hall
- Library- books, databases, access to >2000 online journals

Internationally Recognized Herbarium

Bamboo Museum

Auditorium and Library

Sabbatical Home

Guest House

Hostels for Research Scholars

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