Research in the higher Himalaya

Achievements of high altitude research:

- Ten Long Term Ecological Research Plots for monitoring vegetation in treeline zone
- Spatio temporal vegetation and biomass maps using RS-GIS
- Impact of altitude and temperature on picroside metabolism in Picrorhiza kurrooa
- Propounded a novel carbon sequestering pathway and nitrogen utilization mechanisms
- Key genes responsible for imparting biotic and abiotic stress tolerance in plants
- Commercial floriculture in Lahaul valley
- Germplasm resource centre of sea buckthorn (*Hippophae rhamnoides*)
- Demonstration plots of Picrorhiza kurrooa, Aconitum heterophyllum and Crocus sativus (saffron), Ginseng etc.

Societal activities at high altitude





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CeHAB CeHAB Est. 2011

Mission:

Research

Center for High Altitude Biology

Ribling, P.O. Tandi, Lahaul & Spiti - 175 132 (H.P.) Site Office & Laboratory: Near Diet, Tandi (Lahaul & Spiti) A Unit of CSIR - Institute of Himalayan Bioresource Technology, Palampur (H.P.) www.ihbt.res.in

The National Action Plan on Climate Change by the Prime Minister's Council on Climate Change has a National Mission for sustaining the Himalayan ecosystem. Appreciating the strategic national requirement in global context, it is envisaged to establish a world class centre on adaptation biology and bioprospection research on plants, microbes, insects and ecosystems in the wake of climate change.



Functions:

and *ex situ*)

Bioprospection

altitude ecology

Conservatory of high altitude

plants of importance (in situ

·Climate change impact studies

-Evolving models for high

·Reproductive biology and bioresource generation

•Extension and trainings

Objectives:

- To study and predict the impact of climate change in high altitude ecosystems in Himalaya
- Conservation and characterization of genetic resources of high altitude and their bioprospection for value addition
- Study into high altitude biology

Infrastructure:

- Environmental data towers
- Farm and polyhouse facilities
- Plant and microbial labs
- Pilot plants for post harvest management
- Cold conservation facility
- Food processing facility unit
- Essential oil extraction unit
- Plant tissue culture laboratory
- Training center

Center for High Altitude Biology invites strong participation from government and stakeholders

Demonstration plots



Picrosides biosynthesis pathway

MEP Pathway		MVA
Pyruvate + G	lyceraldehyde-3-phosphate	Acetyl
eoxy-D-xylulose-5-phosphate synthase		
1-Deoxy-	D-xvlulose-5-P	Acetoace
1-deoxy-D-xylulose-5-phosphate reductoisomerase		Accidace
2-C-Methy	vl-D-erythritol-4-P	2 Undrown 2 moth
2-C-methylerythritol 4-phosphate	•	5-nyuloxy-5-meur
4-(CDP)-2-C	-methyl-D-erythritol	
4-(cytidine-5'-diphospho)-2- Cmethylerythritol kinase 4-(CDP)-2-C-n	nethyl-D-erythritol-2-P	Meval
2-C-methylerythritol-2,4- cyclophosphate synthase	↓	Mevalona
2-C-methyl-D-	erythritol-2,4-cyclo-PP	
1-hydroxy-2-methyl-2-(E)-butenyl-4- diphosphate synthase	. ↓	Mevalonate n
l-Hydroxy-2-m l-hydroxy-2-methyl-2-(E)-butenyl 4-diphosphate reductase	ethyl-2-(E)-butenyl-4-PP isopente	nyl pyrophosphate
Dimethyla	llyl pyrophosphate	Isopentenyl
		geranyldiphosphate synthase
	Geranyl	diphosphate
Cinnam (from Pl pathwa	ate/Vanillate henylpropanoid y)	oid moiety 🔶 Glu
	Picr	osides

A novel mechanism of CO₂ fixation at high altitude



Pathway

coenzyme A

acetoacetyl CoA thiolase

etyl coenzyme A

3-hydroxy-3-methylglutary coenzyme A synthase ylglutaryl coenzyme A

3- hydroxy-3-methylgl coenzyme A reductase nate

mevalonate kinase

ate phosphate

phosphomevalonate kinase

rophosphate

mevalonate-5-pyrophosphate decarboxylase pyrophosphate



Long term ecological research plots in tree line zone