

The Enigma of Low Temperature/Cold stress Tolerance in Seabuckthorn

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- Why studying Low Temperature/Cold stress?
- Why Seabuckthorn?



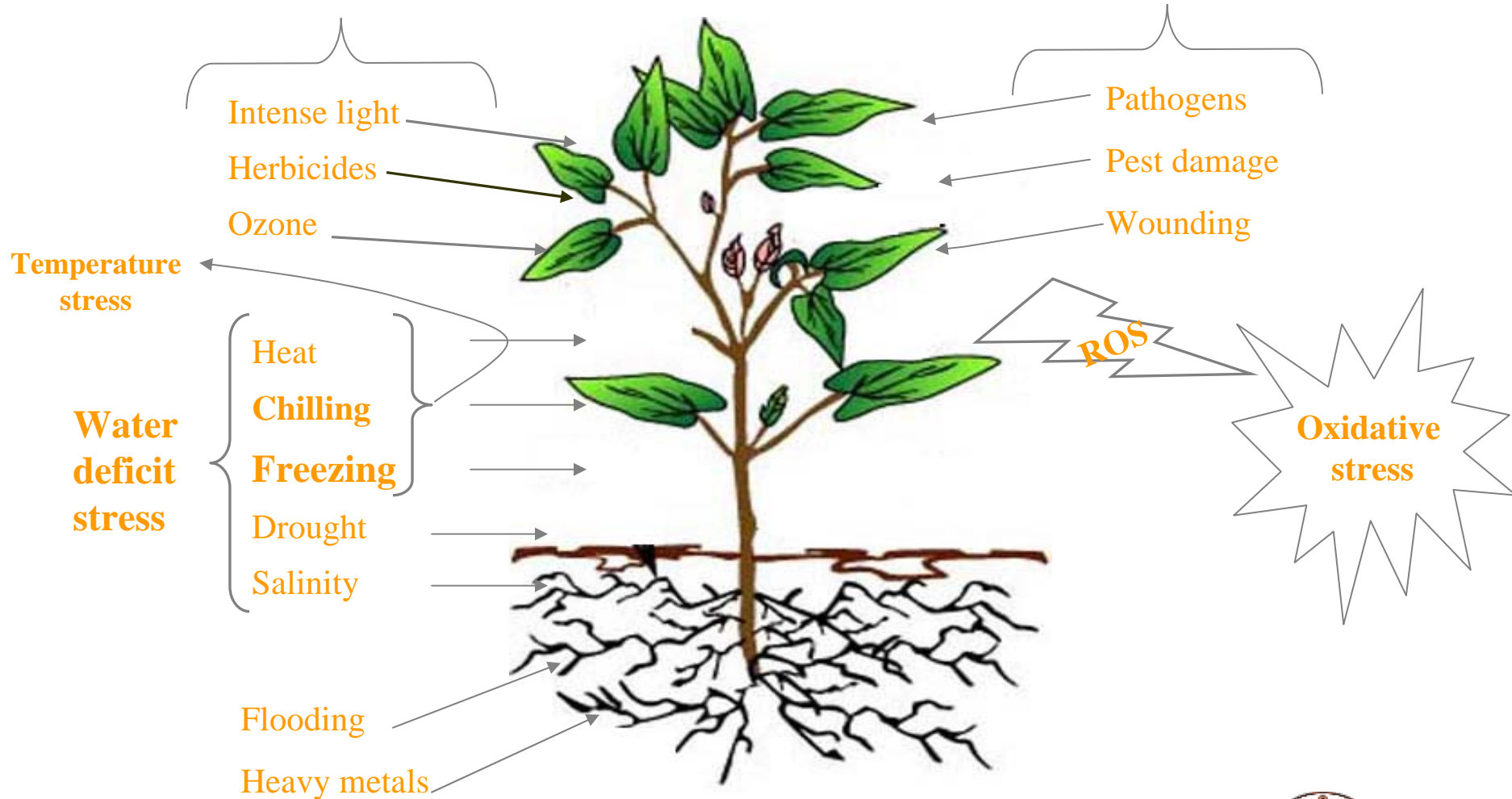
Seabuckthorn ditribution in India

After china, Indian Himalayas possess the world's second largest Seabuckthorn resources.



Abiotic Stresses

Biotic Stresses

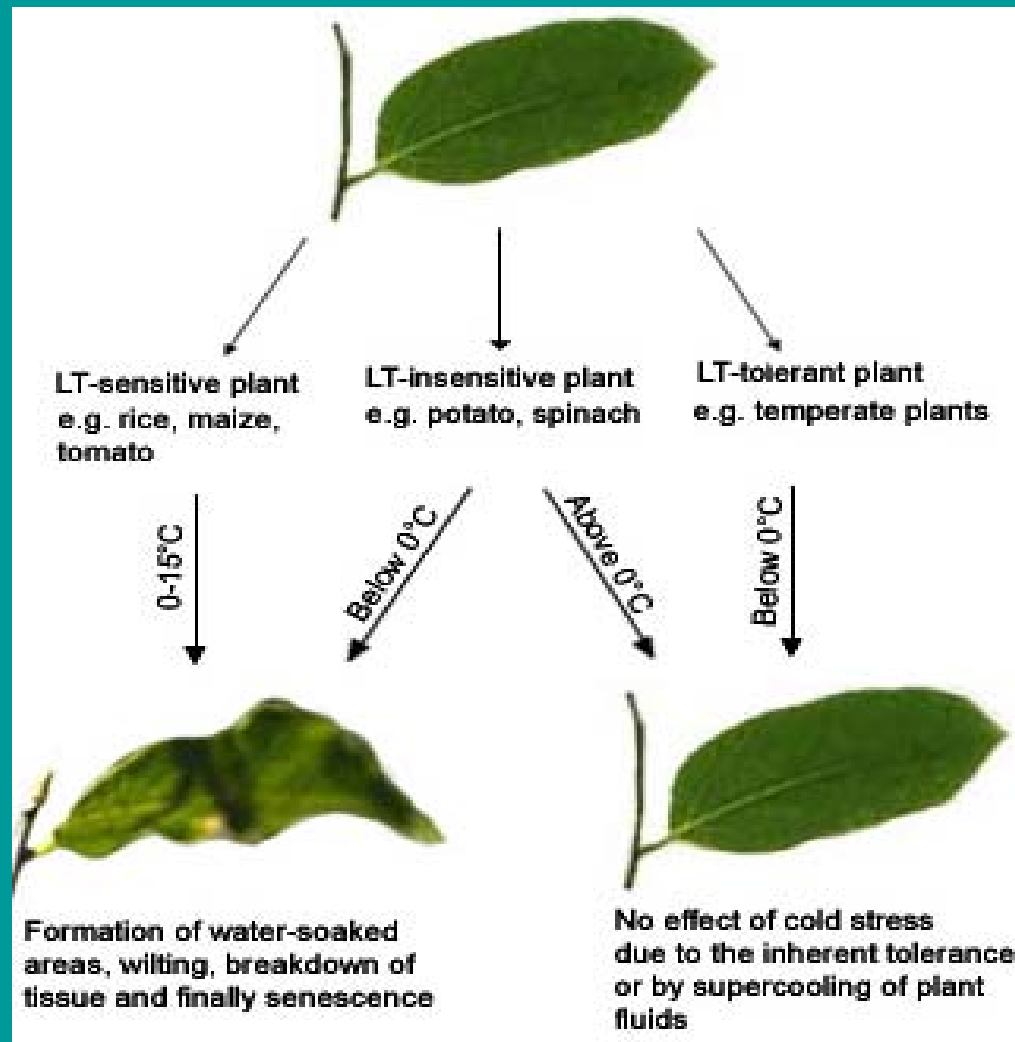


Freezing/ cold temperature is a major environmental factor affecting:

- **Growth and development**
- **Productivity (qualitatively and quantitatively)**
- **Geographical distribution of crops and horticulture plants**
- **Storage of vegetables and fruits**



LT tolerant/sensitive plants

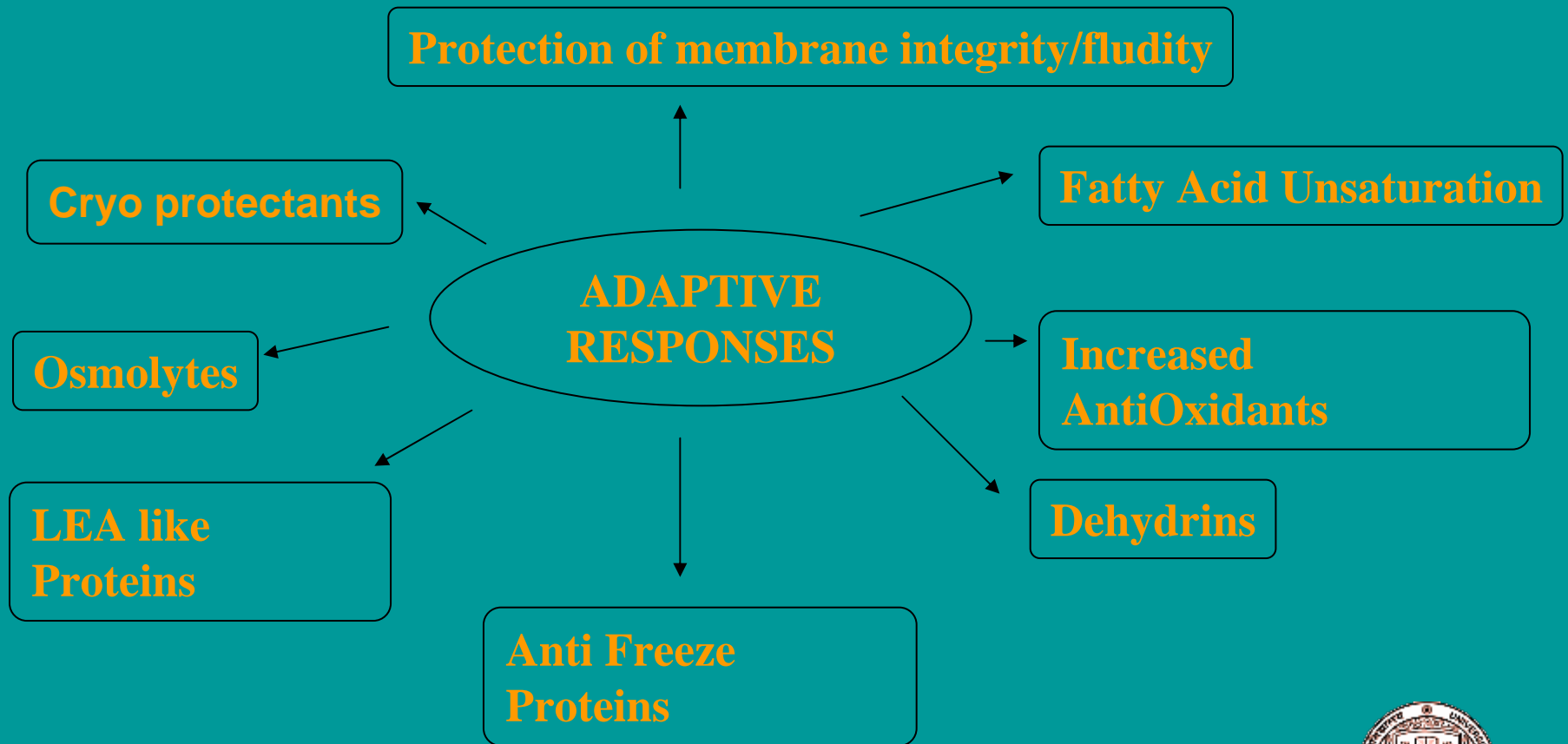


‘Cold Acclimation’

It is a process due to which plants can withstand freezing temperature. When plants are exposed to low non-freezing temperatures, certain biochemical/ physiological changes are induced which ultimately lead to development of “freezing tolerance”.



Some Adaptive Responses to Cold Stress



Signal – LT

Site of perception – membrane?

Transduction - number of components/processes

Response - sensitive/ tolerant



Problems: LT Stress is a multigenic trait

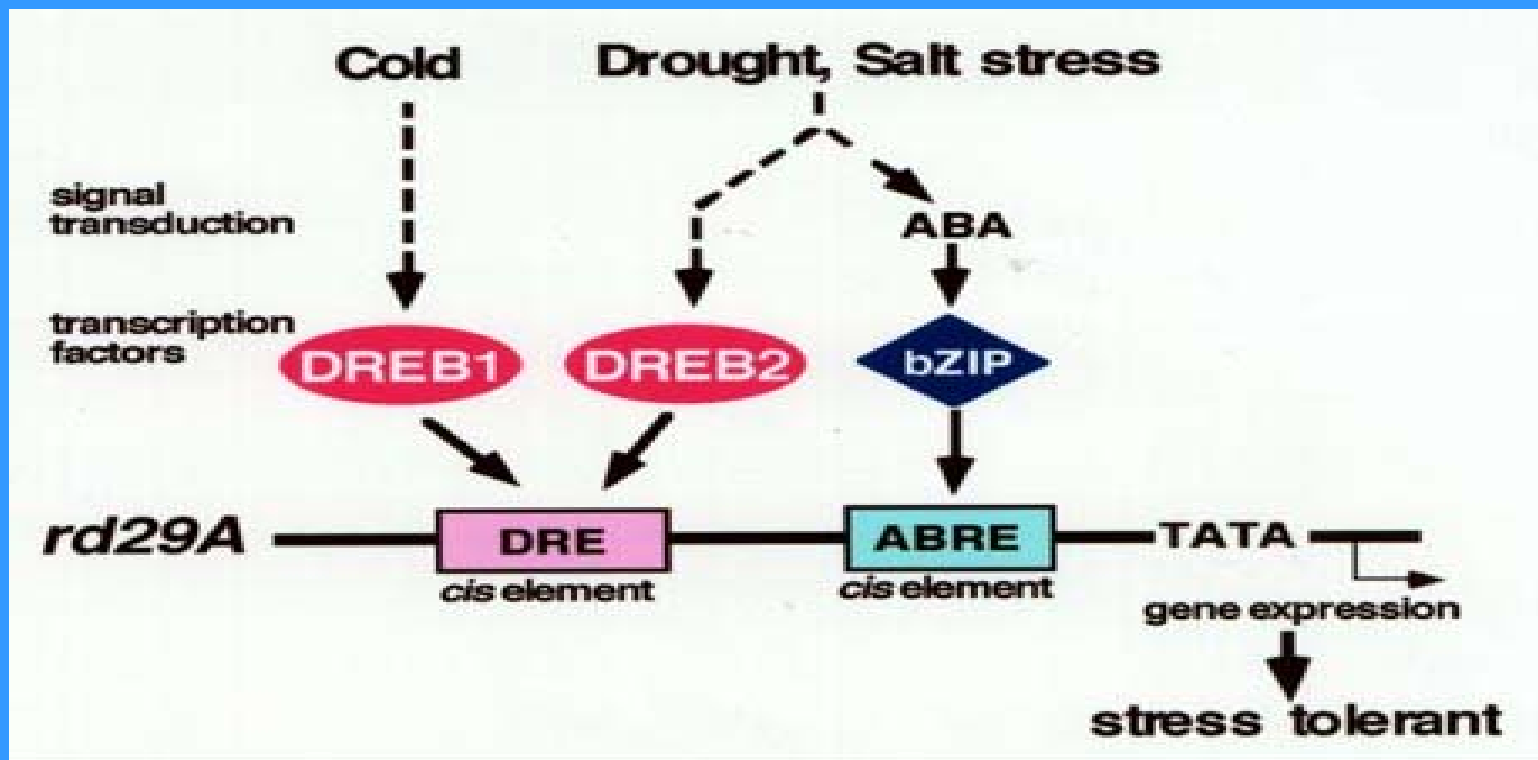
Solution: 1. pyramiding of genes - technical problems

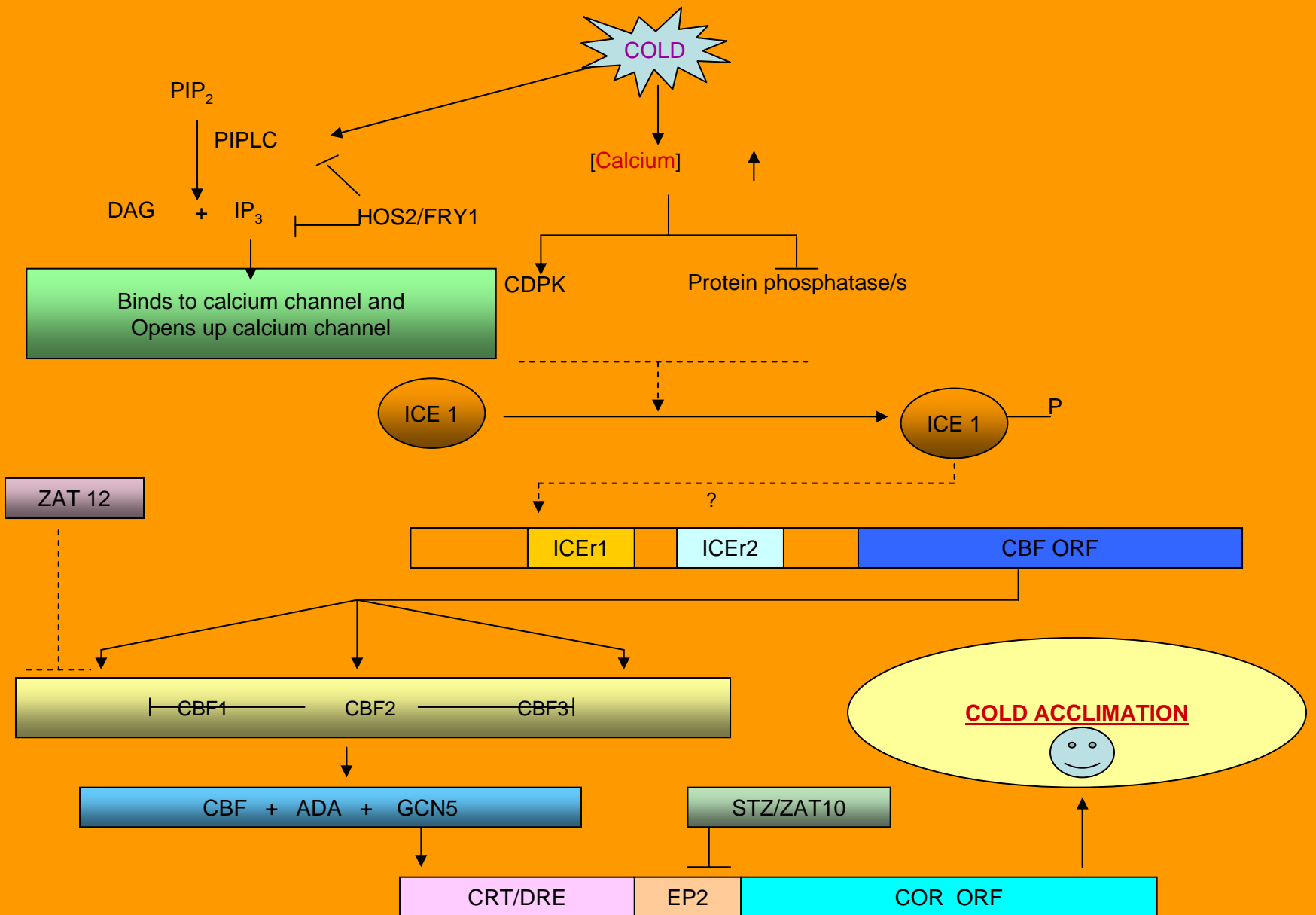
-physiological imbalance

2. work with upstream regulators



ABA dependent and independent abiotic stress signalling





Isolation of *Hippophae rhamnoids* L.C-repeat binding factor (HrCBF1) from Seabuckthorn

➤ Seabuckthorn seedlings- LT treatment for 2 hrs.

➤ Primers (BnCBF5)

Amplicon cloned at EcoRI site in pGEM-T vector

Sequenced and bioinformatic analysis

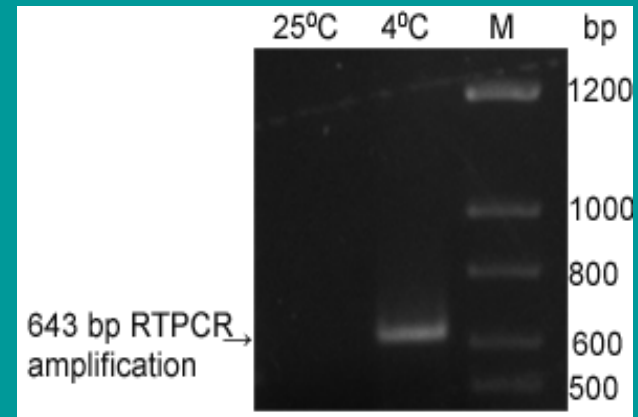
Submitted to gene bank (NCBI- Accession Number

EF502044)

➤ A 643 bp RTPCR amplicon was obtained

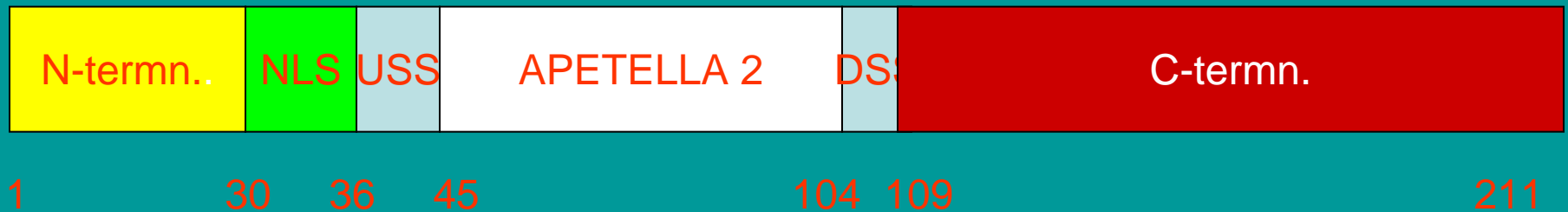
➤ The ORF finder program revealed 636 bp long ORF.

➤ The ORF coded for 211 amino acid.



Seabuckthorn C-repeat binding factor (HrCBF)

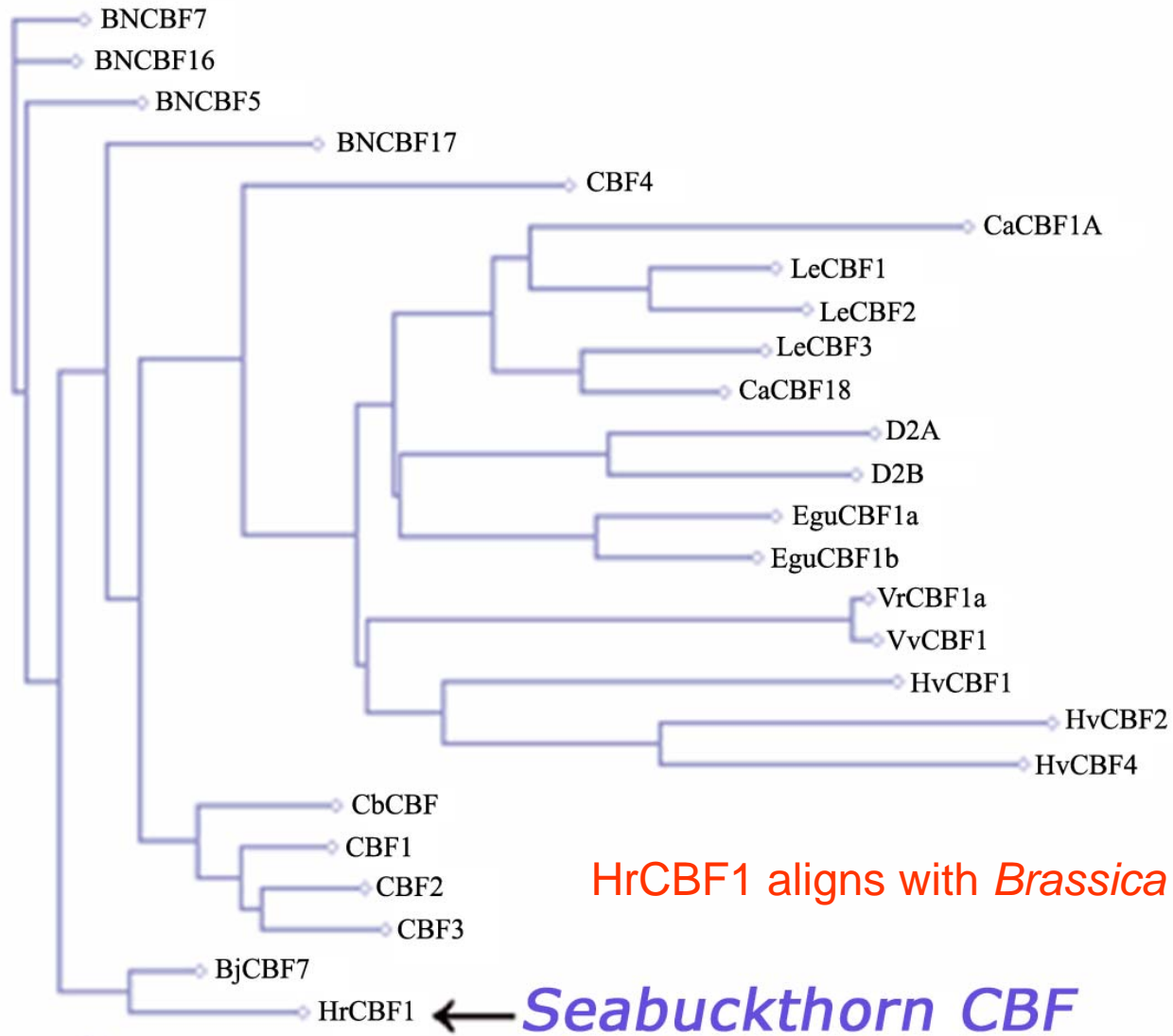
- LT inducible
- Open reading frame: 636 bp
- Total amino acid length: 211
- Contains all the characteristic domains of CBF



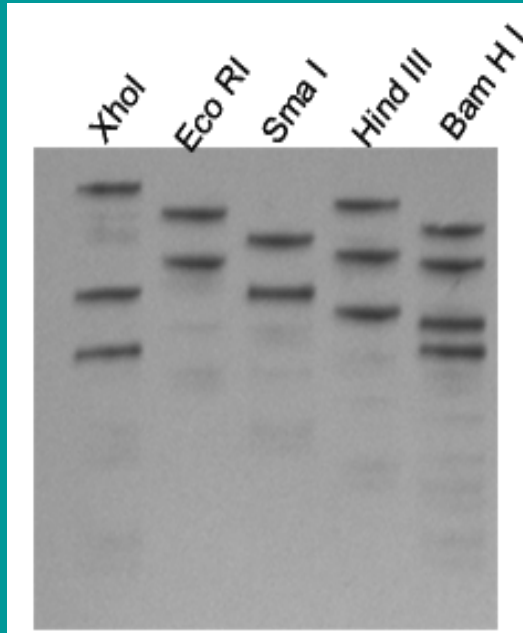
Diagrammatic representation of HrCBF1



The dendrogram of HrCBF with all the dicot and three representative monocot CBFs

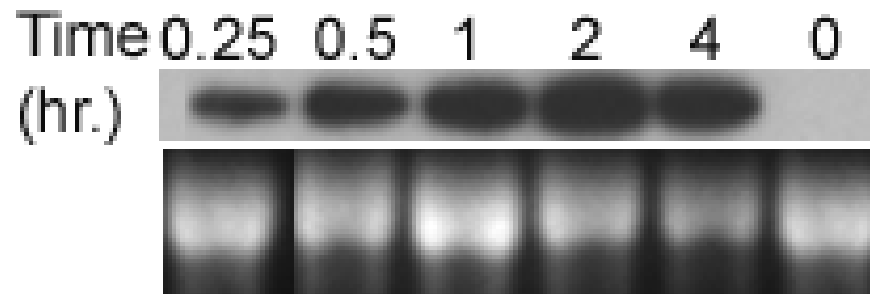


Southern blot analysis of Hr CBF1



- ✓ HrCBF1 has either multiple copies/ isoforms in the genome

HrCBF is a LT inducible gene



The induction of HrCBF1 begins at 15 min and peaks at 2 hr.



25°C



-15°C: 3 hr.

Hippophae rhamnoides: Very cold hardy plant

← Young seedlings show freeze tolerance



25°C



-15°C: 3 hr.



25°C

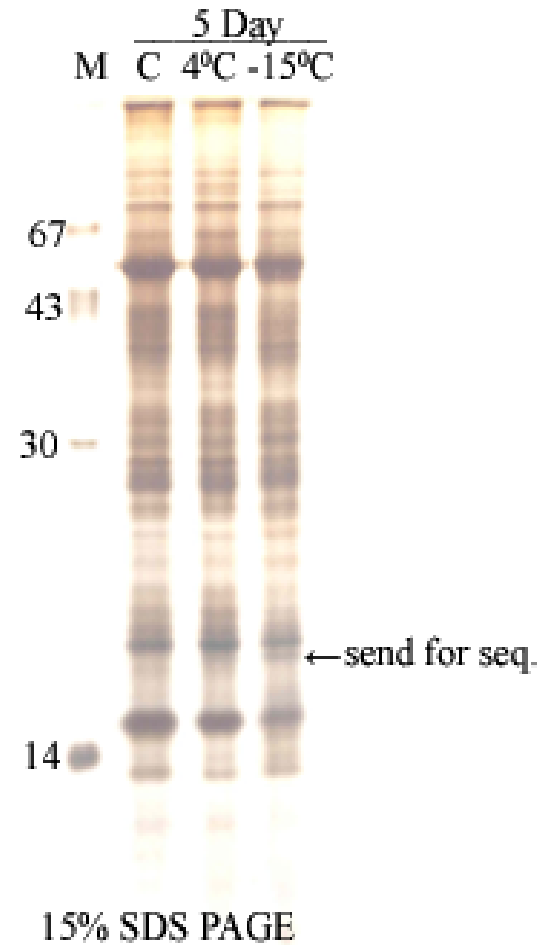
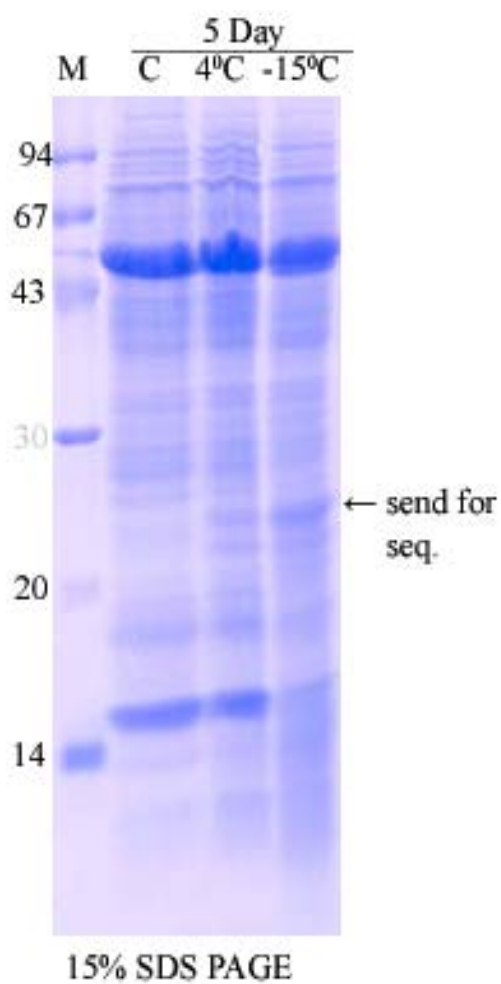


Brassica juncea: LT tolerant

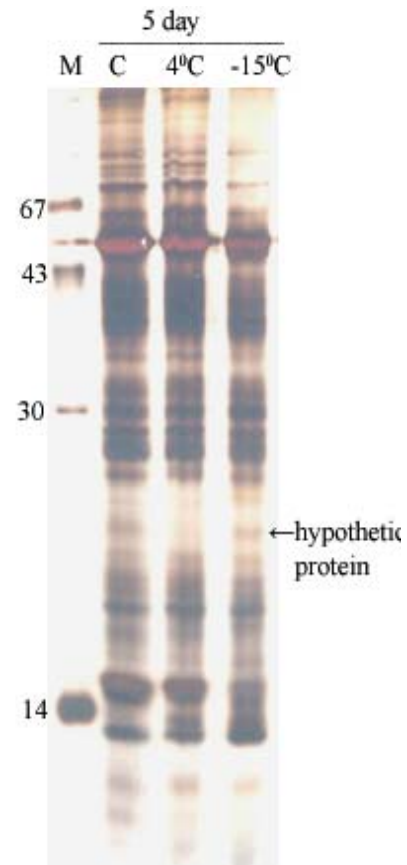
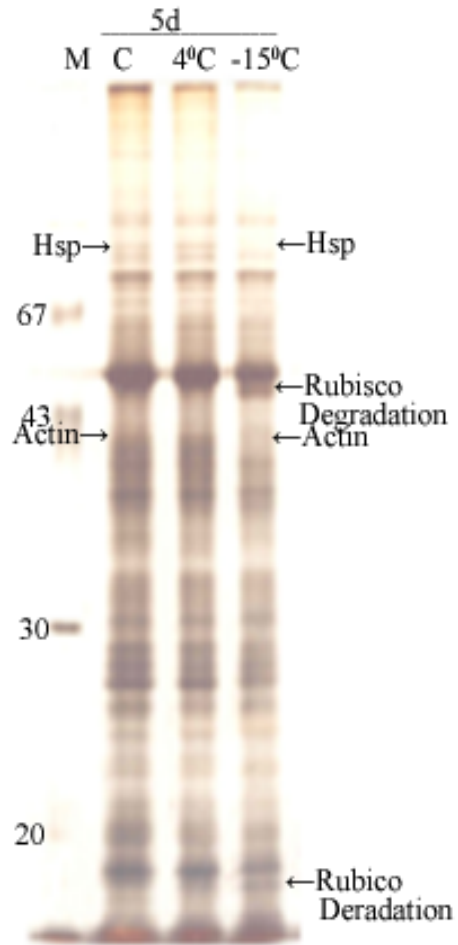
-15°C: 3 hr.

Lycopersicon esculentum: LT sensitive

Freeze induced proteins



Freeze down-regulated proteins



THANK YOU

