

## GEPHE SUMMARY

<p>NCED4 (<a href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=~NCED4~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=~NCED4~#gephebase-summary-title</a>)</p> <p>Published</p>	<p>Gephebase Gene</p> <p>Entry Status</p>	<p>GP00000737</p> <p>Martin</p>	<p>GepheID</p> <p>Main curator</p>
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## PHENOTYPIC CHANGE

<p>Physiology (<a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=~Physiology~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Category=~Physiology~#gephebase-summary-title</a>)</p> <p>Seed dormancy (<a href="https://www.gephebase.org/search-criteria?/and+Trait=~Seed+dormancy~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=~Seed+dormancy~#gephebase-summary-title</a>)</p> <p>Lactuca serriola accession UC96US23</p> <p>Lactuca sativa cv. Salinas</p> <p>Taxon A</p> <p>Domesticated (<a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Domesticated~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Domesticated~#gephebase-summary-title</a>)</p>	<p>Trait Category</p> <p>Trait</p> <p>Trait State in Taxon A</p> <p>Trait State in Taxon B</p> <p>Ancestral State</p> <p>Taxonomic Status</p>	<p>Lactuca sativa</p> <p>Lactuca sativa cv. Salinas</p> <p>Taxon B</p> <p>Domesticated (<a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Domesticated~#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Domesticated~#gephebase-summary-title</a>)</p>	<p>Latin Name</p> <p>Latin Name</p> <p>Common Name</p> <p>Common Name</p> <p>Synonyms</p> <p>Synonyms</p> <p>Rank</p> <p>Rank</p> <p>Lineage</p> <p>Lineage</p> <p>Parent</p> <p>Parent</p> <p>NCBI Taxonomy ID</p> <p>NCBI Taxonomy ID</p> <p>is Taxon A an Intraspecies?</p> <p>is Taxon B an Intraspecies?</p> <p>Taxon A Description</p> <p>Taxon B Description</p>
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## GENOTYPIC CHANGE

<p>CCD4</p> <p>carotenoid cleavage dioxygenase 4; CCD4; nine-cis-epoxycarotenoid dioxygenase 4; T18B16.140; T18B16_140; NCED4; At4g19170</p> <p>3702.AT4G19170.1 (<a href="http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT4G19170.1">http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT4G19170.1</a>)</p> <p>Belongs to the carotenoid oxygenase family.</p> <p>GO:0046872 : metal ion binding (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0046872">https://www.ebi.ac.uk/QuickGO/term/GO:0046872</a>) GO:0010436 : carotenoid dioxygenase activity (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0010436">https://www.ebi.ac.uk/QuickGO/term/GO:0010436</a>) GO:0045549 : 9-cis-epoxycarotenoid dioxygenase activity</p>	<p>Generic Gene Name</p> <p>Synonyms</p> <p>String</p> <p>Sequence Similarities</p> <p>GO - Molecular Function</p>	<p>O49675 (<a href="http://www.uniprot.org/uniprot/O49675">http://www.uniprot.org/uniprot/O49675</a>)</p> <p>UniProtKB Arabidopsis thaliana</p> <p>GenebankID or UniProtKB</p> <p>0</p>
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(<https://www.ebi.ac.uk/QuickGO/term/GO:0045549>)

GO - Biological Process

GO:0016121 : carotene catabolic process

(<https://www.ebi.ac.uk/QuickGO/term/GO:0016121>)

GO - Cellular Component

GO:0009507 : chloroplast (<https://www.ebi.ac.uk/QuickGO/term/GO:0009507>)

GO:0009570 : chloroplast stroma (<https://www.ebi.ac.uk/QuickGO/term/GO:0009570>)

GO:0010287 : plastoglobule (<https://www.ebi.ac.uk/QuickGO/term/GO:0010287>)

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#gephebase-summary-title>)

Molecular Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Molecular Type=^Unknown^#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration Type=^Unknown^#gephebase-summary-title>)

Molecular Details of the Mutation

unknown

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title>)

Main Reference

A gene encoding an abscisic acid biosynthetic enzyme (LsNCED4) collocalizes with the high temperature germination locus Htg6.1 in lettuce (*Lactuca sp.*). (2011)  
(<https://pubmed.ncbi.nlm.nih.gov/20703871>)

Authors

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Abstract

Thermoinhibition, or failure of seeds to germinate when imbibed at warm temperatures, can be a significant problem in lettuce (*Lactuca sativa* L.) production. The reliability of stand establishment would be improved by increasing the ability of lettuce seeds to germinate at high temperatures. Genes encoding germination- or dormancy-related proteins were mapped in a recombinant inbred line population derived from a cross between *L. sativa* cv. Salinas and *L. serriola* accession UC96US23. This revealed several candidate genes that are located in the genomic regions containing quantitative trait loci (QTLs) associated with temperature and light requirements for germination. In particular, LsNCED4, a temperature-regulated gene in the biosynthetic pathway for abscisic acid (ABA), a germination inhibitor, mapped to the center of a previously detected QTL for high temperature germination (Htg6.1) from UC96US23. Three sets of sister BC(3)S(2) near-isogenic lines (NILs) that were homozygous for the UC96US23 allele of LsNCED4 at Htg6.1 were developed by backcrossing to cv. Salinas and marker-assisted selection followed by selfing. The maximum temperature for germination of NIL seed lots with the UC96US23 allele at LsNCED4 was increased by 2-3°C when compared with sister NIL seed lots lacking the introgression. In addition, the expression of LsNCED4 was two- to threefold lower in the former NIL lines as compared to expression in the latter. Together, these data strongly implicate LsNCED4 as the candidate gene responsible for the Htg6.1 phenotype and indicate that decreased ABA biosynthesis at high imbibition temperatures is a major factor responsible for the increased germination thermotolerance of UC96US23 seeds.

Additional References

Expression of 9-cis-EPOXYCAROTENOID DIOXYGENASE4 is essential for thermoinhibition of lettuce seed germination but not for seed development or stress tolerance. (2013)  
(<https://pubmed.ncbi.nlm.nih.gov/23503626>)

## RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

## EXTERNAL LINKS

## COMMENTS

Functional evidence in mutant and RNAi lines