

## GEPHE SUMMARY

Enhanced shoot growth under mannitol stress 2 (EGM2) ( <a +enhanced+shoot+growth+under+mannitol+stress+2+(egm2)^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+Enhanced+shoot+growth+under+mannitol+stress+2+(EGM2)^#gephebase-summary-title</a> )	Gephebase Gene	GP00001630	GepheID
Published	Entry Status	Prigent	Main curator

## PHENOTYPIC CHANGE

Physiology ( <a +physiology^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Physiology^#gephebase-summary-title</a> )	Trait Category		
Plant growth (shoot growth under stress) ( <a +plant+growth+(shoot+growth+under+stress)^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Plant+growth+(shoot+growth+under+stress)^#gephebase-summary-title</a> )	Trait		
Arabidopsis thaliana Col-0 accession sensitive to mannitol	Trait State in Taxon A		
Arabidopsis thaliana Cvi-0 accession and 10 others of various origins with specific tolerance to mannitol	Trait State in Taxon B		
	Ancestral State		
Taxon A	Taxonomic Status		
Intraspecific ( <a +intraspecific^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intraspecific^#gephebase-summary-title</a> )			
	Taxon A		Taxon B
Arabidopsis thaliana ( <a +arabidopsis+thaliana^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Arabidopsis+thaliana^#gephebase-summary-title</a> )	Latin Name	Arabidopsis thaliana ( <a +arabidopsis+thaliana^#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Arabidopsis+thaliana^#gephebase-summary-title</a> )	Latin Name
thale cress	Common Name	thale cress	Common Name
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress	Synonyms	thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis	Lineage	cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis	Lineage
Arabidopsis () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701</a> )	Parent	Arabidopsis () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701</a> )	Parent
3702 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702</a> )	NCBI Taxonomy ID	3702 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702</a> )	NCBI Taxonomy ID
Yes	is Taxon A an Intraspecies?	Yes	is Taxon B an Intraspecies?
Arabidopsis thaliana Col-0 accession	Taxon A Description	Arabidopsis thaliana Cvi-0 accession and 10 others of various origins with specific tolerance to mannitol	Taxon B Description

## GENOTYPIC CHANGE

At1g11300	Generic Gene Name	Q9SXB4 ( <a href="http://www.uniprot.org/uniprot/Q9SXB4">http://www.uniprot.org/uniprot/Q9SXB4</a> )	UniProtKB Arabidopsis thaliana
EGM1; enhanced shoot growth under mannitol stress 1; T28P6.6; T28P6_6; At1g11300	Synonyms	()	GenebankID or UniProtKB
-	String		
	Sequence Similarities		
Belongs to the protein kinase superfamily. Ser/Thr protein kinase family.			
	GO - Molecular Function		
GO:0005524 : ATP binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005524">https://www.ebi.ac.uk/QuickGO/term/GO:0005524</a> )			
GO:0030246 : carbohydrate binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0030246">https://www.ebi.ac.uk/QuickGO/term/GO:0030246</a> )			
GO:0005516 : calmodulin binding ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005516">https://www.ebi.ac.uk/QuickGO/term/GO:0005516</a> )			

GO:0004674 : protein serine/threonine kinase activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0004674>)

GO - Biological Process

GO:0006468 : protein phosphorylation  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006468>)

GO:0048544 : recognition of pollen (<https://www.ebi.ac.uk/QuickGO/term/GO:0048544>)

GO - Cellular Component

GO:0016021 : integral component of membrane  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)

GO:0005886 : plasma membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005886>)

Mutation #1

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title>)

Presumptive Null

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

Molecular Type

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

Aberration Type

Nonsynonymous

SNP Coding Change

2 non-synonymous mutations Ser149Gly and Cys345Gly responsible for hypo-functionality

Molecular Details of the Mutation

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

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ser	Gly	149

A pair of receptor-like kinases is responsible for natural variation in shoot growth response to mannitol treatment in *Arabidopsis thaliana*. (2014)  
(<https://pubmed.ncbi.nlm.nih.gov/24479634>)

Main Reference

Trontin C; Kiani S; Corwin JA; HÄmaty K; Yansouni J; Kliebenstein DJ; Loudet O

Authors

Growth is a complex trait that adapts to the prevailing conditions by integrating many internal and external signals. Understanding the molecular origin of this variation remains a challenging issue. In this study, natural variation of shoot growth under mannitol-induced stress was analyzed by standard quantitative trait locus mapping methods in a recombinant inbred line population derived from a cross between the Col-0 and Cvi-0 *Arabidopsis thaliana* accessions. Cloning of a major QTL specific to mannitol-induced stress condition led to identification of EGM1 and EGM2, a pair of tandem-duplicated genes encoding receptor-like kinases that are potentially involved in signaling of mannitol-associated stress responses. Using various genetic approaches, we identified two non-synonymous mutations in the EGM2[Cvi] allele that are shared by at least ten accessions from various origins and are probably responsible for a specific tolerance to mannitol. We have shown that the enhanced shoot growth phenotype contributed by the Cvi allele is not linked to generic osmotic properties but instead to a specific chemical property of mannitol itself. This result raises the question of the function of such a gene in *A. thaliana*, a species that does not synthesize mannitol. Our findings suggest that the receptor-like kinases encoded by EGM genes may be activated by mannitol produced by pathogens such as fungi, and may contribute to plant defense responses whenever mannitol is present.

Abstract

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Additional References

Mutation #2

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title>)

Presumptive Null

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

Molecular Type

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

Aberration Type

Nonsynonymous

SNP Coding Change

2 non-synonymous mutations Ser149Gly and Cys345Gly responsible for hypo-functionality

Molecular Details of the Mutation

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

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Cys	Gly	345

A pair of receptor-like kinases is responsible for natural variation in shoot growth response to mannitol treatment in *Arabidopsis thaliana*. (2014)  
(<https://pubmed.ncbi.nlm.nih.gov/24479634>)

Main Reference

Growth is a complex trait that adapts to the prevailing conditions by integrating many internal and external signals. Understanding the molecular origin of this variation remains a challenging issue. In this study, natural variation of shoot growth under mannitol-induced stress was analyzed by standard quantitative trait locus mapping methods in a recombinant inbred line population derived from a cross between the Col-0 and Cvi-0 *Arabidopsis thaliana* accessions. Cloning of a major QTL specific to mannitol-induced stress condition led to identification of EGM1 and EGM2, a pair of tandem-duplicated genes encoding receptor-like kinases that are potentially involved in signaling of mannitol-associated stress responses. Using various genetic approaches, we identified two non-synonymous mutations in the EGM2[Cvi] allele that are shared by at least ten accessions from various origins and are probably responsible for a specific tolerance to mannitol. We have shown that the enhanced shoot growth phenotype contributed by the Cvi allele is not linked to generic osmotic properties but instead to a specific chemical property of mannitol itself. This result raises the question of the function of such a gene in *A. thaliana*, a species that does not synthesize mannitol. Our findings suggest that the receptor-like kinases encoded by EGM genes may be activated by mannitol produced by pathogens such as fungi, and may contribute to plant defense responses whenever mannitol is present.

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Additional References

## RELATED GEPHE

Related Genes

5 (EARLY FLOWERING 3(ELF3) [possible pseudo-replicate], ILL1, TZIP1, FUMARASE 2, ICARUS1) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^3702^/and+Trait=Plant growth/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS