

GEPHE SUMMARY

		Gephebase Gene		GepheID
mucilage-modified 2 (mum2) (https://www.gephebase.org/search-criteria?/and+Gene)			GP00000681	
Gephebase="mucilage-modified 2 (mum2)"#gephebase-summary-title)				Main curator
Published		Entry Status	Martin	

PHENOTYPIC CHANGE

		Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait)				
Category="Physiology"#gephebase-summary-title)		Trait		
Mucilage (seeds) (https://www.gephebase.org/search-criteria?/and+Trait="Mucilage)				
(seeds)"#gephebase-summary-title)		Trait State in Taxon A		
Arabidopsis thaliana- Col-0 and other lines				
		Trait State in Taxon B		
Arabidopsis thaliana- Shahdara				
		Ancestral State		
Taxon A				
		Taxonomic Status		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic)				
Status="Domesticated"#gephebase-summary-title)				
Taxon A		Taxon B		
	Latin Name		Latin Name	
Arabidopsis thaliana		Arabidopsis thaliana		
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Arabidopsis		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Arabidopsis		
thaliana"#gephebase-summary-title)		thaliana"#gephebase-summary-title)		
	Common Name		Common Name	
thale cress		thale cress		
	Synonyms		Synonyms	
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis		thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis		
thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress		thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress		
	Rank		Rank	
species		species		
	Lineage		Lineage	
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta;		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta;		
Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae;		Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae;		
eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae;		eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae;		
Camelineae; Arabidopsis		Camelineae; Arabidopsis		
	Parent		Parent	
Arabidopsis () - (Rank: genus)		Arabidopsis () - (Rank: genus)		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3701)		
	NCBI Taxonomy ID		NCBI Taxonomy ID	
3702		3702		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=3702)		
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
Yes		Yes		
	Taxon A Description		Taxon B Description	
Arabidopsis thaliana- Col-0 and other lines		Arabidopsis thaliana- Shahdara		

GENOTYPIC CHANGE

		Generic Gene Name		UniProtKB Arabidopsis thaliana
BGAL6			Q9FFN4 (http://www.uniprot.org/uniprot/Q9FFN4)	
		Synonyms		GenebankID or UniProtKB
beta-galactosidase 6; BGAL6; MBK5.28; MBK5_28; MUCILAGE-MODIFIED 2;			OAO95642 (https://www.ncbi.nlm.nih.gov/nucleotide/OAO95642)	
At5g63800				
		String		
3702.AT5G63800.1				
(http://string-db.org/newstring.cgi/show_network_section.pl?identifier=3702.AT5G63800.1)				
		Sequence Similarities		
Belongs to the glycosyl hydrolase 35 family.				
		GO - Molecular Function		
GO:0004565 : beta-galactosidase activity				
(https://www.ebi.ac.uk/QuickGO/term/GO:0004565)				
		GO - Biological Process		

GO:0005975 : carbohydrate metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005975>)
GO:0048354 : mucilage biosynthetic process involved in seed coat development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048354>)
GO:0009827 : plant-type cell wall modification
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009827>)

GO - Cellular Component

GO:0005773 : vacuole (<https://www.ebi.ac.uk/QuickGO/term/GO:0005773>)
GO:0048046 : apoplast (<https://www.ebi.ac.uk/QuickGO/term/GO:0048046>)
GO:0005618 : cell wall (<https://www.ebi.ac.uk/QuickGO/term/GO:0005618>)

Presumptive Null

Yes ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~Yes^#gephebase-summary-title))

Molecular Type

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

Aberration Type

Deletion ([https://www.gephebase.org/search-criteria?/and+Aberration Type=~Deletion^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type=~Deletion^#gephebase-summary-title))

Deletion Size

10-99 bp

Molecular Details of the Mutation

44bp deletion in exon 15; from Leu-662 onwards. This deletion causes a frame-shift mutation changing the next 23 amino acids followed by the introduction of a stop codon.

Experimental Evidence

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

Main Reference

A naturally occurring mutation in an Arabidopsis accession affects a beta-D-galactosidase that increases the hydrophilic potential of rhamnogalacturonan I in seed mucilage. (2007)
(<https://pubmed.ncbi.nlm.nih.gov/18165330>)

Authors

Macquet A; Ralet MC; Loudet O; Kronenberger J; Mouille G; Marion-Poll A; North HM

Abstract

The Arabidopsis thaliana accession Shahdara was identified as a rare naturally occurring mutant that does not liberate seed mucilage on imbibition. The defective locus was found to be allelic to the mum2-1 and mum2-2 mutants. Map-based cloning showed that MUCILAGE-MODIFIED2 (MUM2) encodes the putative beta-D-galactosidase BGAL6. Activity assays demonstrated that one of four major beta-D-galactosidase activities present in developing siliques is absent in mum2 mutants. No difference was observed in seed coat epidermal cell structure between wild-type and mutant seed; however, weakening of the outer tangential cell wall by chemical treatment resulted in the release of mucilage from mum2 seed coat epidermal cells, and the mum2 mucilage only increased slightly in volume, relative to the wild type. Consistent with the absence of beta-D-galactosidase activity in the mutant, the inner layer of mucilage contained more Gal. The allocation of polysaccharides between the inner and outer mucilage layers was also modified in mum2. Mass spectrometry showed that rhamnogalacturonan I in mutant mucilage had more branching between rhamnose and hexose residues relative to the wild type. We conclude that the MUM2/BGAL6 beta-D-galactosidase is required for maturation of rhamnogalacturonan I in seed mucilage by the removal of galactose/galactan branches, resulting in increased swelling and extrusion of the mucilage on seed hydration.

Additional References

RELATED GEPHE

Related Genes

2 (PER36, PME16) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=~3702^/and+Trait=Mucilage/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon+ID=~3702^/and+Trait=Mucilage/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

4 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~mucilage-modified 2 \(mum2\)^/and+Taxon ID=~3702^/or+Gene Gephebase=~mucilage-modified 2 \(mum2\)^/and+Taxon ID=~3702^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=~mucilage-modified+2+(mum2)^/and+Taxon+ID=~3702^/or+Gene+Gephebase=~mucilage-modified+2+(mum2)^/and+Taxon+ID=~3702^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS