GEPHE SUMMARY

Gephebase Gene
mucilage-modified 2 (mum2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^mucilage-modified 2 (mum2)^#gephebase-summary-title)

GepheID
GP00000681

Entry Status
Published

Main curator
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

Latin Name
Arabidopsis thaliana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Arabidopsis thaliana^#gephebase-summary-title)

Common Name
thale cress

Synonyms
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis

Parent
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3701)

NCBI Taxonomy ID
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3702)

is Taxon A an Infraspecies?
Yes

Taxon A Description
Arabidopsis thaliana- Col-0 and other lines

Taxon B

Latin Name
Arabidopsis thaliana (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Arabidopsis thaliana^#gephebase-summary-title)

Common Name
thale cress

Synonyms
thale cress; mouse-ear cress; thale-cress; Arabidopsis thaliana (L.) Heynh.; Arabidopsis thaliana (thale cress); Arabidopsis_thaliana; Arbisopsis thaliana; thale kress

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; eudicotyledons; Gunneridae; Pentapetalae; rosids; malvids; Brassicales; Brassicaceae; Camelineae; Arabidopsis

Parent
Arabidopsis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3701)

NCBI Taxonomy ID
3702 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 3702)

is Taxon B an Infraspecies?
Yes

Taxon B Description
Arabidopsis thaliana- Shahdara

GENOTYPIC CHANGE

Generic Gene Name
BGAL6

Synonyms
beta-galactosidase 6; BGAL6; MBK5.28; MBK5_28; MUCILAGE-MODIFIED 2; 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

UniProtKB Arabidopsis thaliana
Q9FFN4 (http://www.uniprot.org/uniprot/Q9FFN4)

GenebankID or UniProtKB
OAO95642 (https://www.ncbi.nlm.nih.gov/nuccore/OAO95642)

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)

Molecular Type

Coding (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)

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)

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, PMEI6) (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)

EXTERNAL LINKS

COMMENTS