GEPHE SUMMARY

Gephebase Gene
ALMT gene cluster (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^ALMT gene cluster^#gephebase-summary-title)

GepheID
GP00000079

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
Metal tolerance (https://www.gephebase.org/search-criteria?/and+Trait=^Metal tolerance^#gephebase-summary-title)

Trait State in Taxon A
Secale cereale (Al-tolerant)

Trait State in Taxon B
Secale cereale (Al-sensitive)

Ancestral State
Data not curated

Taxonomic Status
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Domesticated^#gephebase-summary-title)

Taxon A

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

Common Name
rye

Synonyms
Secale cereale subsp. cereale; rye; Secale cereale L.; Secale cereal

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticodae; Triticeae; Hordeinae; Secale

Parent
Secale () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4549)

NCBI Taxonomy ID
4550 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4550)

is Taxon A an Infraspecies?
No

Taxon B

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

Common Name
rye

Synonyms
Secale cereale subsp. cereale; rye; Secale cereale L.; Secale cereal

Rank
species

Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Pooideae; Triticodae; Triticeae; Hordeinae; Secale

Parent
Secale () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4549)

NCBI Taxonomy ID
4550 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 4550)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
ALMT1

Synonyms
ALMT1-1; ALMT1-2

String
-

Sequence Similarities
Belongs to the aromatic acid exporter (TC 2.A.85) family.

GO - Molecular Function
-

GO - Biological Process
GO:0015743 : malate transport (https://www.ebi.ac.uk/QuickGO/term/GO:0015743)

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)

UniProtKB Triticum aestivum
Q76LB1 (http://www.uniprot.org/uniprot/Q76LB1)

GenebankID or UniProtKB
ABY52957 (https://www.ncbi.nlm.nih.gov/nuccore/ABY52957)

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

Molecular Type

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

Aberration Type

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

Indel Size

unknown

Molecular Details of the Mutation

Copy number Variant

Experimental Evidence

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

Main Reference

An ALMT1 gene cluster controlling aluminum tolerance at the Alt4 locus of rye (Secale cereale L.). (2008) (https://pubmed.ncbi.nlm.nih.gov/18493079)

Authors

Collins NC; Shirley NJ; Saeed M; Pallotta M; Gustafson JP

Abstract

Aluminum toxicity is a major problem in agriculture worldwide. Among the cultivated Triticeae, rye (Secale cereale L.) is one of the most Al tolerant and represents an important potential source of Al tolerance for improvement of wheat. The Alt4 Al-tolerance locus of rye contains a cluster of genes homologous to the single-copy Al-activated malate transporter (TaALMT1) Al-tolerance gene of wheat. Tolerant (M39A-1-6) and intolerant (M77A-1) rye haplotypes contain five and two genes, respectively, of which two (ScALMT1-M39.1 and ScALMT1-M39.2) and one (ScALMT1-M77.1) are highly expressed in the root tip, typically the main site of plant Al tolerance/susceptibility. All three transcripts are upregulated by exposure to Al. High-resolution genetic mapping identified two resistant lines resulting from recombination within the gene cluster. These recombinants exclude all genes flanking the gene cluster as candidates for controlling Alt4 tolerance, including a homolog of the barley HvMATE Al-tolerance gene. In the recombinants, one hybrid gene containing a chimeric open reading frame and the ScALMT1-M39.1 gene each appeared to be sufficient to provide full tolerance. mRNA splice variation was observed for two of the rye ALMT1 genes and in one case, was correlated with a approximately 400-bp insertion in an intron.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS