

GEPHE SUMMARY

	Gephebase Gene		GepheID
MATE1/ZmMATE1 (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=MATE1/ZmMATE1#gephebase-summary-title)		GP00000566	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		
Metal tolerance (https://www.gephebase.org/search-criteria?/and+Trait=Metal+tolerance#gephebase-summary-title)			
	Trait State in Taxon A		
Zea mays - Cateto AI237 (AI-tolerant)			
	Trait State in Taxon B		
Zea mays - Cateto L53 (AI-sensitive)			
	Ancestral State		
Data not curated			
	Taxonomic Status		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=Domesticated#gephebase-summary-title)			
Taxon A		Taxon B	
	Latin Name		Latin Name
Zea mays (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Zea+mays#gephebase-summary-title)		Zea mays (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Zea+mays#gephebase-summary-title)	
	Common Name		Common Name
-		-	
	Synonyms		Synonyms
Zea mays var. japonica; maize; Zea mays L.; Zea mays mays		Zea mays var. japonica; maize; Zea mays L.; Zea mays mays	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea		cellular organisms; Eukaryota; Viridiplantae; Streptophyta; Streptophytina; Embryophyta; Tracheophyta; Euphyllophyta; Spermatophyta; Magnoliophyta; Mesangiospermae; Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; PACMAD clade; Panicoideae; Andropogonodae; Andropogoneae; Tripsacinae; Zea	
	Parent		Parent
Zea () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4575)		Zea () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4575)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
4577 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4577)		4577 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4577)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
Yes		Yes	
	Taxon A Description		Taxon B Description
Zea mays - Cateto AI237 (AI-tolerant)		Zea mays - Cateto L53 (AI-sensitive)	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB GenebankID or UniProtKB
-			
	Synonyms	AFW74381 (https://www.ncbi.nlm.nih.gov/nuccore/AFW74381)	
	String		
-			
	Sequence Similarities		
-			
	GO - Molecular Function		
-			
	GO - Biological Process		
-			
	GO - Cellular Component		
-			
Unknown (https://www.gephebase.org/search-criteria?/and+Presumptive+Null=Unknown#gephebase-summary-title)			Presumptive Null

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

Molecular Type

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

Aberration Type

unknown

Molecular Details of the Mutation

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

Experimental Evidence

Two functionally distinct members of the MATE (multi-drug and toxic compound extrusion) family of transporters potentially underlie two major aluminum tolerance QTLs in maize. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20003133>)

Main Reference

Maron LG; Piñeros MA; Guimarães CT; Magalhaes JV; Pleiman JK; Mao C; Shaff J; Belicuas SN; Kochian LV

Authors

Crop yields are significantly reduced by aluminum (Al) toxicity on acidic soils, which comprise up to 50% of the world's arable land. Al-activated release of ligands (such as organic acids) from the roots is a major Al tolerance mechanism in plants. In maize, Al-activated root citrate exudation plays an important role in tolerance. However, maize Al tolerance is a complex trait involving multiple genes and physiological mechanisms. Recently, transporters from the MATE family have been shown to mediate Al-activated citrate exudation in a number of plant species. Here we describe the cloning and characterization of two MATE family members in maize, ZmMATE1 and ZmMATE2, which co-localize to major Al tolerance QTL. Both genes encode plasma membrane proteins that mediate significant anion efflux when expressed in *Xenopus* oocytes. ZmMATE1 expression is mostly concentrated in root tissues, is up-regulated by Al and is significantly higher in Al-tolerant maize genotypes. In contrast, ZmMATE2 expression is not specifically localized to any particular tissue and does not respond to Al. [(14)C]-citrate efflux experiments in oocytes demonstrate that ZmMATE1 is a citrate transporter. In addition, ZmMATE1 expression confers a significant increase in Al tolerance in transgenic *Arabidopsis*. Our data suggests that ZmMATE1 is a functional homolog of the Al tolerance genes recently characterized in sorghum, barley and *Arabidopsis*, and is likely to underlie the largest maize Al tolerance QTL found on chromosome 6. However, ZmMATE2 most likely does not encode a citrate transporter, and could be involved in a novel Al tolerance mechanism.

Abstract

Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS