

GEPHE SUMMARY

	Gephebase Gene		GepheID
heavy metal atpase3 (HMA3) (https://www.gephebase.org/search-criteria?/and+Gene)		GP00000445	
Gephebase="heavy metal atpase3 (HMA3)"#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		
Metal tolerance (https://www.gephebase.org/search-criteria?/and+Trait="Metal)			
tolerance"#gephebase-summary-title)	Trait State in Taxon A		
Oryza sativa var. Nipponbare			
	Trait State in Taxon B		
Oryza sativa var. Anjana Dhan (Cd-accumulating)			
	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
Oryza sativa		Oryza sativa	
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Oryza		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Oryza	
sativa"#gephebase-summary-title)	Common Name	sativa"#gephebase-summary-title)	Common Name
rice		rice	
	Synonyms		Synonyms
rice; red rice; Oryza sativa L.		rice; red rice; Oryza sativa L.	
	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;	
Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzaceae;		Liliopsida; Petrosaviidae; commelinids; Poales; Poaceae; BOP clade; Oryzoideae; Oryzaceae;	
Oryzinae; Oryza	Parent	Oryzinae; Oryza	Parent
Oryza () - (Rank: genus)		Oryza () - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4527)	NCBI Taxonomy ID	(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4527)	NCBI Taxonomy ID
4530		4530	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4530)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=4530)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
Yes		Yes	
	Taxon A Description		Taxon B Description
Oryza sativa var. Nipponbare		Oryza sativa var. Anjana Dhan (Cd-accumulating)	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Arabidopsis thaliana
HMA3		P0CW78 (http://www.uniprot.org/uniprot/P0CW78)	
	Synonyms		GenebankID or UniProtKB
-		0	
	String		
-			
	Sequence Similarities		
Belongs to the cation transport ATPase (P-type) (TC 3.A.3) family. Type IB subfamily.			
	GO - Molecular Function		
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)			
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)			
GO:0008551 : cadmium-exporting ATPase activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0008551)			
GO:0016463 : zinc-exporting ATPase activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0016463)			
	GO - Biological Process		

GO:0071585 : detoxification of cadmium ion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071585>)

GO - Cellular Component

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

GO:0005774 : vacuolar membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005774>)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

H80R

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

Gene limiting cadmium accumulation in rice. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20823253>)

Authors

Ueno D; Yamaji N; Kono I; Huang CF; Ando T; Yano M; Ma JF

Abstract

Intake of toxic cadmium (Cd) from rice caused Itai-itai disease in the past and it is still a threat for human health. Therefore, control of the accumulation of Cd from soil is an important food-safety issue, but the molecular mechanism for the control is unknown. Herein, we report a gene (OsHMA3) responsible for low Cd accumulation in rice that was isolated from a mapping population derived from a cross between a high and low Cd-accumulating cultivar. The gene encodes a transporter belonging to the P(1B)-type ATPase family, but shares low similarity with other members. Heterologous expression in yeast showed that the transporter from the low-Cd cultivar is functional, but the transporter from the high-Cd cultivar had lost its function, probably because of the single amino acid mutation. The transporter is mainly expressed in the tonoplast of root cells at a similar level in both the low and high Cd-accumulating cultivars. Overexpression of the functional gene from the low Cd-accumulating cultivar selectively decreased accumulation of Cd, but not other micronutrients in the grain. Our results indicated that OsHMA3 from the low Cd-accumulating cultivar limits translocation of Cd from the roots to the above-ground tissues by selectively sequestering Cd into the root vacuoles.

Additional References

RELATED GEPHE

Related Genes

1 (Nramp aluminum transporter1) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^4530^/and+Trait=Metal tolerance/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS